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# The Southern Surgeon

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## THE C. JEFF MILLER LECTURESHIP

### His Teachings in the Management of Uterine Fibroids*

LUCIEN A. LEDOUX, M.D., F.A.C.S.
New Orleans, La.

WHEN Dr. Wilkinson honored me by extending an invitation to be on this program, he referred to the fact that as I had been one of Dr. Miller's pupils and associates, he felt that it was fitting that I should deliver this address. While it is true that I was Dr. Miller's pupil and his associate in many professional and extra professional activities, I was never a member of his personal staff; nevertheless, our friendship was close from the early years of my practice, as evidenced by the fact that he was one of those who sponsored my invitation to become a member of the American College of Surgeons, and my last contact with him two days before the onset of his fatal illness was a conversation in which he expressed a desire that I become a member of this Congress. In the intervening years we had many common interests and frequent occasions for association, and these gave me the opportunity to know and expand my appreciation of this fine gentleman and brilliant surgeon.

In recalling Dr. Miller's teachings, one left an indelible impression on me, and that was his very profound feeling in regard to conservatism, especially in pelvic surgery, and more particularly in problems affecting the uterus. The wealth of material available to him from a large private practice, and from the great Charity Hospital in New Orleans, gave him the opportunity to study one of the gynecological problems in which he showed great interest, and on which he was a prolific writer; namely, the management of uterine fibroids.

*Presented before the Southeastern Surgical Congress Assembly, Washington, D. C., March 6, 1950.

As this subject relates to one of our major problems in surgery, I feel that it is interesting to review some of his experiences, knowing that in any discussion of this subject he always gave a careful analysis and study to the needs of the different types of cases, and throughout his writings on this subject of uterine fibroids he stresses the need of giving consideration to the conservative treatment of the group, which could best be handled in that way.

The diagnosis of uterine fibroid is not a difficult one to make, and even the presence of very small, single or multiple tumors is easily detected by the experienced examiner. Frequently the diagnosis is made in the course of a routine pelvic check-up without the patient giving any symptoms of a pelvic disturbance. In other instances the presence of these tumors can be detected where symptoms are referable to other structures within the female pelvis. I recall an instance in which I saw a patient complaining of symptoms and showing signs which pointed to a lower intestinal obstruction. In this case a fibroid tumor, approximately the size of a fetal head, was found in the posterior cul-de-sac compressing the sigmoid-rectum, thereby producing the complaining symptoms. Immediate relief was obtained by removal of the tumor.

The diagnosis of uterine fibroids having been made, the conscientious surgeon must weigh at least three possible procedures before determining what course to follow: first, in those cases which show small, single or multiple growths in the uterus without giving rise to any symptoms, there is obviously no need of any active treatment, simply observation, for we have all reached the rational conclusion that the mere presence of a fibroid tumor does not necessarily justify interference.

In the second group, comprising 25 to 35 per cent, is placed those tumors which are amenable to radium treatment, which is always hemostatic and is curative in many cases. Its simplicity of administration, its relative freedom from mortality and morbidity and its general excellent results are recommended as an ideal procedure. The value of this treatment shows the best results in women over 40 years of age, providing the tumor is not much larger than a walnut, the uterus is free of any signs of a sub-mucous or degenerating tumor and there is no evidence of even a latent pelvic infection. In determining the dosage, the physical and mental health of the patient should be given careful consideration. It is frequently better for the physician, who knows his patient best, to determine the dosage in an individual case rather than to leave it to the radium therapist who can work at best only by rule. I feel that this comment is important.

In the third group can be placed those cases in which surgery appears to be definitely indicated, and while the presence of fibroids is not necessarily an indication for hysterectomy, it is indicated in a majority of cases which demand operative interference. The technic of this operation has been so thoroughly standardized, and the results in competent hands so uniformly good, it is difficult to convince the average surgeon that any other method of treatment could possibly be as satisfactory. In the majority of cases, particularly when dealing with large fibroids of the multiple type or those associated with degenerative changes or adnexal disease, hysterectomy is the operation of choice. In the hands of the experienced surgeon, either the total or subtotal hysterectomy is a safe procedure and usually meets all surgical requirements. In young women, especially in young married women with the history of sterility and with no pelvic pathology, the surgeon should give serious consideration in approaching the problem to performing a myomectomy instead of a hysterectomy.

It is in that age group, between the ages of 20 to 38 years, that myomectomy has its greatest field of usefulness, as within this period the preservation of function is of great importance. Therefore, whenever possible, hysterectomy should be held in abeyance until after the child bearing period and the approach of the menopause, after which time the conservation of the organ is of lesser importance. Myomectomy is seldom the operation of choice in the presence of pelvic inflammatory disease, which is a frequent accompaniment of fibroid tumors and is a complication which exists in 35 to 40 per cent of all such cases, therefore conservatism is rarely possible if the tubes and ovaries are diseased, for the uterus then becomes a useless organ and a hysterectomy is the rational procedure under the circumstances.

The decision as to whether to do a myomectomy will be influenced by the number and size of the new growth, as well as by the type and the general condition of the uterine musculature. The single subperitoneal or interstitial growth furnishes the ideal indication for myomectomy, but frequently several growths of all types and sizes may be removed and a perfectly serviceable organ left. I advocate the single or multiple myomectomy, providing the tumors are not too large and do not encroach too much on the integrity of the organ, as a very satisfactory and useful procedure, which, regrettably, is not done often enough. From the standpoint of safety it is a surgical procedure which, in competent hands, has no higher mortality than hysterectomy.

A study of the results following myomectomy is very interesting. Statistical studies show that menstruation returns to normal in at least 85 per cent of the cases so treated, and in Dr. Miller's study the average was over 90 per cent. In this connection, and I am quoting Dr. Miller, "I might add that fibroid growths do not recur as often as is usually supposed, and my own recurrence is under 3 per cent. Moreover, if menstrual disturbances do continue or the growth recur, a second operation is rarely necessary. Graduated doses of radium may be used with safety even in young women and after 40 the menopausal dose may be administered at once."

From the standpoint of sterility, the benefits that result from the performance of myomectomy are difficult to gauge. In studying the results, we must remember that sterility is a problem into which many insoluble facts enter, but in spite of these unstable and unfavorable circumstances, Dr. Miller found that his own figures parallel those of Arthur Giles, in that they both reported pregnancies occurring in excess of 25 per cent of the cases.

Technically, in properly selected cases, the procedure is not difficult and hemorrhage is easily controlled, and it offers no greater dangers than does hysterectomy, providing that suturing is properly done, and if care is taken to avoid ischemia from too tight suturing the operation is safe and thoroughly satisfactory. Careful suturing, and the use of coagulants topically will thoroughly control hemorrhage and reduce bleeding to the slightest ooze. The use of this procedure in tumors growing in the lower uterine segment is not fully recommended and is not always a simple procedure due to the high vascularity of this area. The ideal case for myomectomy is the single well defined encapsulated tumor, for, as a rule, the case presenting numerous small growths does not give satisfactory results.

In the treatment of uterine tumors there are two considerations; namely, bleeding must be controlled and the growth of the tumor stopped and, if possible, made to disappear, and in deciding whether a hysterectomy, myomectomy or radium is indicated, one must take into consideration not only the number, size and location of the tumor, but also the age, and the social and financial condition of the patient. When a woman is dependent on her own efforts and, perhaps, is supporting a family also; when it is imperative that she return to work at the earliest possible moment and in the best possible condition, no chance must be taken of a second operation or even of further treatment. As myomectomy has few indications after 38 years, the age of the patient is an important consideration. In single women in the late thirties, the indication for myomectomy

might not be so urgent as in the married woman who desired children but remained sterile.

Surgery will continue to be the best treatment for the majority of fibroids, but many can be treated with radium to the extent that the growth will be arrested, the symptoms relieved and the functions preserved.

Large growths should be promptly removed, as well as those that are increasing in size, but many cases present serious complications to surgery because of heart, kidney and other lesions, especially severe anemia. Many of these can be made safe surgical risks by first controlling hemorrhage, which can readily be done by radium applications, and then supplemented by blood transfusions.

In fibroids the approximate size of the growth and the amount of hemorrhage should determine the duration and amount of the radium exposure, and the good results obtained by radium therapy in small fibroids; those varying in size from the smallest, to those as large as a hen's egg, make it a debatable question as to whether operation is indicated in this class of cases.

Those who have had experience with radium in selected cases must agree that the curative results obtained are fully equal to radical surgical procedures and offer the advantages of freedom from pain and various postoperative complications. Furthermore, if radium fails we still have surgery to fall back on and nothing has been lost in waiting. Unquestionably radium is a valuable and necessary adjunct in gynecological surgery even though it was never intended to supplant surgery.

The chief argument that might be raised against radium in the treatment of fibroids is the liability of overlooking a malignancy. This is a valid objection, but certainly not sufficient to convince one that all fibroids should be operated upon because a small percentage becomes malignant. A careful diagnosis made with the assistance of a competent pathologist should reduce this risk to a minimum. In comparing the advantages of radium treatment with deep x-ray therapy, the choice is unquestionably in favor of radium, as it saves time for the patient, and with a single application of radium in most cases, bleeding is controlled; whereas, the same results with deep x-ray therapy can only be obtained after several exposures given over an extended period of time.

Pregnancy when complicated by uterine fibroids can present a number of problems, some of which are not easily surmounted. These tumors, occurring frequently as they do in the lower uterine segment, do not favor the occurrence of pregnancy, and, if preg-

nancy does occur in this area abortions frequently result; therefore, tumors in this area which are a bar to delivery are frequently a bar to conception.

Tumors situated in the upper portion of the uterus of the subperitoneal type rarely, if ever, demand surgical intervention unless their size prevents the uterus rising to accommodate a growing fetus. In such instances, if necessary, a myomectomy can be done.

Tumors invading the anterior wall of the uterus close to the lower segment are not necessarily a barrier to a normal delivery. Pedunctulated tumors, especially those that gravitate into the posterior cul-de-sac, and discovered in early pregnancy can, frequently, by careful manipulation be lifted out of the cul-de-sac, and with the use of the knee-chest position this complication can often be relieved, and the pregnancy go on to term without any untoward results.

In all cases of pregnancy complicated by uterine fibroids, it must be remembered that the increased vascularity existing at this time favors a rapid increase in growth of these tumors and this fact must be taken into our calculations of what is best to be done for the patient. Generalizing, it can be said that the prognosis depends upon the type and location of the growth, and it can be stated that the higher the location of the tumor and the nearer it approaches the subperitoneal form the less the danger of it complicating the pregnancy or delivery.

Cases of this kind must be studied and evaluated on the basis of the finding in each case. In the background, there is always a possibility of a maternal and fetal mortality in excess of 50 per cent, and this must be kept in mind in the beginning of the finding of a pregnancy complicated by fibroids and must be an influence in determining what is best to be done.

In conclusion, it appears that while the advances in surgery and anesthesia, coupled with the use of blood, sulfa drugs and the antibiotics, have added immeasurably to the safety and success in surgery; nevertheless, it is also possible that these very factors may at times dull our diagnostic valuation and submerge conservatism with radicalism, the latter being, in my opinion, a great tendency today.

I feel that we should examine Dr. Miller's writings carefully and reserve for a group of women, even though it be small, a more moderate course of treatment. Surely we should muster all of the facts and bring our best judgment to bear in cases, especially those affecting young women, where mutilating or castrating operations are being contemplated.

# COMPLICATIONS OF SPLENECTOMY

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In recent years much has been written concerning surgery of the spleen. New indications for splenectomy have been found, and the results from this operation have become better formulated. The complications involved in the performance of splenectomy, however, have received little attention. The discussion of Norcross[1] in 1944 is the only report in which the complications have been featured. Since that time, new understanding of physiology has extended the scope of this method of treatment. It is felt that an appreciation of the complications will contribute to a further lowering of morbidity and mortality rates.

## Physiology of the Spleen

The functions of the spleen, many of which are poorly understood, are summarized in Table 1. To comment briefly on these, we may consider first the role of the spleen as a *blood reservoir.*

TABLE 1

Chart showing the function of the spleen.

*Functions of the Spleen*

I. Blood Reservoir
II. Production of formed elements of the blood
  a. Complete hematopoiesis during fetal life
  b. Lymphocyte and monocyte formation during adult life
III. Regulation of formed elements of the blood
  a. Control of erythrocytes, granulocytes and platelets in the peripheral blood by:
    1. Regulation of bone marrow maturation and emission
    2. Sequestration and phagocytosis
IV. Erythrocyte Destruction
  a. Increased fragility of erythrocytes
  b. Regulation of thickness of red cell envelope
  c. Regulation of life span of the erythrocytes
V. Large Functional Component of Lymphoid and Reticulo-Endothelial Systems:
  a. Phagocytosis
  b. Antibody production
  c. Bacterial and particle filtration
  d. Hemoglobin degradation and bilirubin formation
  e. Iron storage

*From the Whitehead Department of Surgery, Emory University School of Medicine, Emory University, Georgia.

Presented during the Washington Assembly of The Southeastern Surgical Congress, March 6-9, 1950.

Although it is generally acknowledged that this function belongs to the spleen, as pointed out in the classic observations of Roy[2] and Barcroft,[3] there is controversy yet as to the manner in which the spleen carries out this function. Recent investigation[4] would indicate that changes in splenic volume observed following hemorrhage or epinephrine administration are not the result of splenic contractions *per se,* but follow actual changes in splenic blood flow. The *role of the spleen in hematopoiesis* is normally limited to lymphocyte and monocyte production during adult life, functioning in this respect as a member of the lymphoid and reticulo-endothelial systems. During fetal life, however, it produces all formed elements of the blood, and, in certain derangements of the bone marrow during adult life, the spleen is capable of resuming its fetal function. Another major function of the adult spleen is the control of *erythrocytes, granulocytes, and platelets in the peripheral blood.* Englebreth-Holm,[5] Dameshek and Estren,[6] and Isaac[7] favor the splenic hormone theory of regulation, which postulates endocrine regulation of the maturation and release of these elements of the bone marrow. Kaznelson[8] and Wiseman and Doan,[9] on the other hand, believe that this function of blood regulating is carried out in the sequestration of the blood in splenic sinuses and phagocytosis by the reticulo-endothelial system. The idea that the spleen is the "graveyard" of the red cell is not a new one, and although the manner of *erythrocyte destruction* is poorly understood, resistance to hemolysis and lengthened life span of the erythrocyte following splenectomy are evidences of this function. The *lymphoid and reticulo-endothelial functions* of the spleen center in phagocytosis, filtration, antibody production, and bilirubin formation.

## Indications for Splenectomy

Since 1900 experiences with splenectomies have considerably modified the operative indications. Many of the early splenectomies, performed in cases of blood disorders, resulted in a tremendously high mortality. The ineffectiveness of splenectomy in such a condition as leukemia was evident. Many other conditions have since been established as definite contraindications. Agnogenic myeloid metaplasia, in which the bone marrow sclerosed and the spleen assumes the function of erythropoiesis, is a condition in which splenectomy should not be used. In the past five years, however, a better understanding of the spleen has *added* to the list of indications the interesting functional manifestation of hypersplenism.

A detailed discussion of all the operative indications for splenectomy is inappropriate at this time. Only the functional splenic disorders will be considered here.

*Idiopathic thrombocytopenic purpura* is most frequently found in females under 21. Easy bruising or purpuric spots on the skin and mucous membranes are usually the first symptoms, but menorrhagia, hematuria, melena, retinal and cerebral hemorrhage, or bleeding gums may be the presenting manifestations. The spleen is not usually enlarged. Anemia following blood loss is occasionally present, but decreased or absent platelets are characteristic. The prolonged bleeding time, absence of clot retraction, and positive tourniquet test furnish evidence for diagnosis. The bone marrow shows megakaryoctosis with reduction or absence of platelet production. It is important to distinguish primary from secondary purpura, inasmuch as splenectomy is of little value in the latter.

*Familial hemolytic icterus* is an intrinsic hemolytic anemia, the symptoms of which include chronic variable jaundice and upper abdominal discomfort. Anemia is usually moderate except during hemolytic crises, when it may become severe. In 70 per cent of all patients, there is splenomegaly, but the occurrence of hepatomegalia is unusual. The increased number of spherocytes which resist hemolysis is a diagnostic feature of the disease, as is the occurrence of spherocytosis in asymptomatic members of the patient's family. The serum bilirubin is increased and the icteric index is commonly between 15 and 30. Except during the hemolytic crisis, there is a reticulosis of from 5 to 20 per cent, and fecal and urinary urobilinogen is elevated. The bone marrow shows normoblastic erythropoietic hyperplasia. Gallstones are frequently found in the young adult. Acquired hemolytic icterus, in which splenectomy is occasionally helpful, may be differentiated from congenital hemolytic icterus by the Coombs test.

*Hypersplenism.* Damshek and Estren,[7] proponents of the theory of hypersplenism, define this state as "exaggerated splenic functions with *selective* or *total* reductions of red cells, leucocytes, and platelets." According to the blood elements involved, it may take several forms. *Primary splenic neutropenia,* a condition described by Wiseman and Doan,[9] is characterized by a disposition to frequent infection, splenomegaly, and leukopenia with pronounced neutropenia. The patient may complain of fatigue and arthralgia, and moderate icterus may be present. The bone marrow, in marked contrast to the peripheral blood, shows a normal or increased number of granulocytes. A secondary neutropenia, a presentation of Felty's syndrome which also includes a rheumatoid arthritis and splenomegaly, occurs. In addition thrombocytopenia may accompany splenic neutropenia, in which case the bone marrow shows an increased number of megakaryocytes. *Primary splenic pancytopenia* results when all

marrow elements represented in the blood are depressed, and is therefore characterized by splenomegaly, neutropenia, thrombocytopenia, and hemolytic or non-hemolytic anemia. In anemia of the hemolytic type the fecal urobilinogen is always elevated, even though the serum bilirubin may not be increased. The bone marrow shows hyperplasia of all elements. Weakness, fatigue, pallor, and anorexia are symptomatic of the anemia, and disposition to infection and easy bleeding are evidences of neutropenia and thrombocytopenia. A secondary pancytopenia may occur in various states predisposing to splenomegaly (Table 2).

TABLE 2

*Summary of the usually accepted indications for splenectomy.*

*Indications for Splenectomy*

I. Conditions Affecting the Spleen Primarily:
   1. Rupture
   2. Torsion of splenic pedicle
   3. Neoplasms
   4. Abscess
   5. Cysts: (a) Parasitic, (b) Non-parasitic
   6. Infarct
   7. Surgical adjuncts

II. Conditions Affecting Bone Marrow and the Blood:
   1. Idiopathic thrombocytopenic purpura
   2. Familial hemolytic icterus
   3. Primary splenic neutropenia
   4. Primary splenic panhematocytopenia

III. Congestive Splenomegalies:
   1. Cirrhosis
   2. Schistosomiasis
   3. Splenic vein thrombosis

*Splenic anemia,* or congestive splenomegaly (Banti's disease), may be idiopathic or secondary to cirrhosis or portal vein thrombosis. Usually of insidious onset, it may manifest itself suddenly in tarry stools or hematemesis. The spleen is usually enormously enlarged, but the anemia is normocytic and moderate in degree. Leukopenia is constant, and lymphocytes are affected as well as neutrophils. Occasionally thrombocytopenia may be severe enough to cause prolonged bleeding time. Bone marrow findings may be normal, or reveal a condition of myeloid hyperplasia or the maturation arrest of hypersplenism.

## Physiologic Sequelae of Splenectomy

The physiologic changes that follow splenectomy are related to the blood volume and the composition of the peripheral blood. The amount of reduction in blood volume depends upon the size of the

spleen and the operative technique employed. Changes in the composition of the peripheral blood includes increases in the numbers of red cells, white cells, and platelets. The morphology of the red cell is altered;[10] target cells, Howell-Jolly bodies, and siderocytes may appear. As a result of the thinness of the cell membrane, the erythrocyte shows increased resistance to hemolysis. The life of the erythrocyte is increased over the accepted normal of from 22 to 28 days to a span of from 32 to 38 days.[11] The total white count is approximately doubled, both granulocytes and lymphocytes being increased with the latter elements showing the greatest absolute rise. An important consideration is the platelet increase, which begins immediately following splenectomy and may reach a peak of 1,500,000 on the eleventh to the thirtieth postoperative day.

TABLE 3

*Statistical summary of a review of the complications in 777 splenectomies.*

**SUMMARY OF COMPLICATIONS IN 777 SPLENECTOMIES**

| COMPLICATIONS: | ROSS 1889 | PINKLESTEIN 1944 | BAYER 1927 | KLOPP 1928 | CONDON 1928 | DIAMOND 1929 | DAVIS & SHARPE 1933 | VAN BUREN & CURTIS 1940 | COLE & WALKER 1949 | LAHEY & BORGESS 1934–47 | % IN 777 CASES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. VENOUS THROMBOSIS | | 6.0 | 23.7 | | | 3.9 | 7.2 | | | 4.8 | 3.7 |
| PORTAL | | | 4.7 | | | 3.9 | 5.7 | | | | |
| PERIPHERAL | | | 9.5 | | | | 1.5 | | | 4.8 | |
| PULMONARY | | | 9.5 | | | | | | | | |
| 2. INFECTION | 4.4 | 10.6 | 14.2 | | 24.9 | 1.9 | | | 1.1 | 12.0 | 3.3 |
| SEPSIS | 3.3 | | | | | | | | | | |
| PERITONITIS | 1.1 | 10.6 | | | | | | | | | |
| PNEUMONIA | | | 14.2 | | 4.1 | 1.9 | | | 1.1 | | |
| ABSCESS (Sub-diaph.) | | | | | | | | | | 3.6 | |
| WOUND INFECTION | | | | | 20.8 | | | | | | |
| MISCELLANEOUS | | | | | | | | | | 8.4 | |
| 3. HEMORRHAGE | 13.3 | 9.1 | | | | | | 3.6 | 4.6 | 3.6 | 2.8 |
| CRISIS | | 4.5 | | | | | | 1.8 | 1.1 | | |
| WOUND OOZING | | | | 20.0 | 4.1 | | | | | | |
| SLIPPED PEDICLE | | | | | | | | 1.8 | | | |
| 4. SHOCK | 8.8 | 1.5 | | | | | | | | | |
| 5. MISCELLANEOUS | | | | | | | | | | | |
| HEPATITIS | | 3.0 | | | | | | | | | |
| CIRRHOSIS | | | | | | | | | 1.1 | | |
| ASCITES | | | | | | | | | | 2.4 | |

## The Complications of Splenectomy

The major complications of splenectomy have long been recognized as thrombosis, hemorrhage, and infection. Other complications occur less frequently. The available literature has been reviewed and an analysis of the complications is made from 777 splenectomies[12-21] reported during the period from 1889 to 1949. A better understanding of the complications of splenectomy has been brought about by four factors: (1) understanding of the indications for which splenectomy is performed, (2) the better operative techniques employed, (3) application of the newer advances in physiology, and (4) the advent of antibiotics.

A classification of the complications of splenectomy is set forth in Table 4.

TABLE 4

*Chart showing classification of complications of splenectomy.*

*Classification of the Complications of Splenectomy*

I. Venous Thrombosis
- a. Portal
- b. Peripheral
  1. Pulmonary and cerebral embolism

II. Hemorrhage
- a. Surgical Errors
  1. Inadequate ligation of splenic pedicle
  2. Injury to diaphragm and splenic capsule
  3. Removal of a portion of pancreas
- b. Altered Physiology
  1. Ruptured varices
  2. Oozing from wound and splenic bed
  3. Slipped splenic pedicle

III. Infection
- a. Abdominal
  1. Subdiaphragmatic abscess
  2. Peritonitis
  3. Wound infection
- b. Extra-abdominal

IV. Miscellaneous
- a. Failure to remove all splenic tissue (accessory spleens)
- b. Fever, idiopathic or otherwise
- c. Hemolytic crises

*Thrombosis.* Following splenectomy the incidence of venous thrombosis, either *portal* or *peripheral,* was 3.7 per cent in the 777 cases. The mode of production of these types of thrombosis is probably different, and the processes involved should be considered.

Abdominal thrombosis following splenectomy was first reported by Delatour[22] in 1895. The patient died three weeks postoperatively as a result of thrombosis of the splenic vein extending into the portal vein, with complete occlusion of the mesenteric veins. This classic illustrates one of the most dreaded complications of splenectomy. Wilkins[23] noted (1923) that splenectomy is the only operation which produces a tendency to mesenteric thrombosis, the contributing factors being: (1) stasis incident to splenomegaly, (2) dilatation and tortuosity of the splenic vein with histologic changes in the vein wall, (3) operative trauma, (4) ligation of the splenic vein, and (5) infection. Simmonds[24] attached much significance to alteration in blood composition, namely, the occurrence of thrombocytosis, leukocytosis, dehydration, and serum protein alteration. Alteration in blood flow has also been cited as a factor, since the splenic vein normally carries 20 per cent of the portal blood.

Mesenteric thrombosis occurs most frequently when splenectomy is performed for congestive splenomegaly (Banti's disease). Davis and Sharpe[18] reviewed 193 splenectomies for Banti's disease, in which the incidence of portal thrombosis was 5.7 per cent. Bryce[25] observed that abdominal thrombosis is less apt to occur when a low platelet count follows splenectomy.

These data would indicate that peripheral thrombosis occurs less frequently following splenectomy than does mesenteric thrombosis. Certainly there are not as many predisposing factors, for of those cited above, only venous stasis and alteration in the blood composition are applicable in reference to peripheral thrombosis. The postoperative elevation of thrombocytes is a possible cause of peripheral thrombosis. If this is so, peripheral thrombosis following splenectomy ought to be considerably higher than that following other operations. Evans and Fowler[26] found no significant rise in platelet numbers following operations other than splenectomy, and they concluded that such rise was not significant.

Pulmonary and cerebral embolism, since it follows peripheral thrombosis, is not increased in splenectomy. The following case report describes the occurrence of a peripheral thrombosis following splenectomy:

T. J. W., a 33 year old mechanic, was admitted to Grady Memorial Hospital on May 10, 1949. He had a history of lifelong anemia with episodes of weakness and shortness of breath. Two brothers showed a similar anemia. On two previous admissions he was found to have bronze pigmentation of the face, neck, and extremities, an enlarged heart with a systolic murmur, and enlarged liver and spleen. He developed diabetes a short while before his second admission. Laboratory reports revealed a hemoglobin concentration of 4.0 Gm. The red and white cell counts were 1,660,000 and 3,100, with a differential white count of 6 per cent stabs, 52 per cent segmenters, and 42 per cent lymphocytes. The platelet count was 105,000. The hematocrit was 16. The bone marrow showed erythrogluic hyperplasia consistent with refractive anemia or hypersplenism.

On the thirteenth hospital day splenectomy was performed, and liver and lymph-node biopsies were obtained. All tissues showed fibrosis with deposition of iron pigment, consistent with hemochromatosis.

On August 10, 1949, he was seen in the Emergency Clinic with bilateral saphenous thrombosis and treated with 300,000 units of penicillin. He did not receive anticoagulants, nor were the superficial veins ligated. Under conservative management, the course has been regressive. There is residual edema of both legs below the knees. The prognosis is yet undetermined.

*Hemorrhage.* Hemorrhage, either operative or postoperative, was formerly the most frequent complication of splenectomy. In Vincent's series (1898),[27] it was found responsible for 75 per cent of fatalities following splenectomy. In the present series, however,

the incidence of hemorrhage was found to be 2.8 per cent in 777 cases.

Hemorrhage following splenectomy results from two general causes: (1) surgical errors and (2) altered physiology.

The surgical errors which result in immediate or postoperative hemorrhage are (1) injury to the short gastric vessels, (2) damage to the tail of the pancreas, (3) trauma to the diaphragm, (4) inadequate ligation of the pedicle, and (5) accidental tearing of the splenic capsule. Injury to the pancreas is a serious complication. Connors[16] reported severe wound hemorrhage resulting from pancreatic injury followed by the release of enzymes.

The hemorrhage encountered in altered physiology includes (1) ruptured varices, (2) oozing into the splenic bed, (3) oozing from the abdominal wound, and (4) slipped splenic pedicle. Ruptured varices and slipped pedicle are most prone to occur in the congestive splenomegalies where portal hypertension is the major complication. Oozing from the wound and splenic bed is seen when the bleeding time is prolonged, as in idiopathic thrombocytopenic purpura and primary splenic pancytopenia; it also occurs in hypoprothrombinemia, a sequela of impaired liver function. The following report describes a case in which postoperative oozing occurred.

Six days before admission to Emory University Hospital, H. V. T., an 18 year old student, noted on the inner surfaces of his cheeks a number of bluish spots which bled following toothbrush trauma. Similar spots were noted subsequently on the skin, and two days before admission the patient experienced bleeding from the nose and mouth. He reported no previous hemorrhage from any site.

Three weeks prior to admission he had undergone tooth extraction without complication. There had been no exposure to chemicals. Family history and past history were noncontributory.

Over the skin of the trunk and extremities, and most pronouncedly over the thighs, were seen numerous purple spots which varied in size from petechiae to areas .5 centimeters in diameter. The nasal and buccal mucous membranes exhibited several hemorrhagic areas from 2 to 3 millimeters in diameter. The heart and lungs were normal to auscultation and percussion, and the liver and spleen were not palpable. There was no swelling or tenderness of the joints.

The hemoglobin concentration was 17.2 Gm. The red and white cell counts were 5,064,000 and 8,250, with a differential white count of 71 per cent segmenters, 25 per cent lymphocytes, 2 per cent monocytes, 1 per cent eosinophils, and 1 per cent basophils. There were no platelets observed. The clotting time was 20 minutes, and bleeding time was 6 minutes. The tourniquet test showed a slight petechial reaction. The bone marrow was reported as cellular with megakaryocyte increase (.7 per cent), but with no evidence of platelet production.

A diagnosis of idiopathic thrombocytopenic purpura was made, and splenec-

tomy was performed. The spleen weighed 192 Gm., and, on microscopic examination, showed increase in the intracellular connective tissue with slight decrease in lymphoid elements. The penicilliary arteries showed marked medial thickening and hyalinization.

Six hours postoperatively the platelet count was 120,000 and continued to rise, reaching 600,000 one week later. The immediate postoperative period was complicated by slight oozing from the wound, which continued less than 48 hours. On the third postoperative day, however, the patient complained of left upper quadrant discomfort. Dullness and diminished breath sounds were noted at the left base posteriorly. Five days later he developed constant pain in the left shoulder, and one week later there was pain in the left lower quadrant and left groin.

He was placed on prophylactic heparin and dicumarol. A roentgenogram showed elevation of the left diaphragm with no evidence of pleural effusion. Temperature ranged between 100 and 101 degrees following operation. It was felt that subdiaphragmatic effusion or hematoma was responsible for the diaphragm elevation and prolonged course. An aspiration below the drain site yielded 725 c.c. of dark, odorless, fluid blood, following which the patient noted much improvement. A second aspiration yielded 1,100 c.c. of similar fluid, which proved to be sterile on culture. The patient was discharged on the twenty-fourth postoperative day. There was no recurrence of the bleeding.

*Infection.* In the series studied, the incidence of infection was 3.3 per cent, which was greater than the incidence of hemorrhage, but less than that of thrombosis. Since most of the splenectomies reported were performed before the advent of antibiotics, it is felt that this figure is high, and that the present incidence is now less than 1 per cent. Bacteremia, peritonitis, pneumonia, subdiaphragmatic abscess, and wound infection with subsequent ventral hernia are complications which have been reported.

*Other complications.* Other complications following splenectomy which have been cited are (1) shock, (2) idiopathic postoperative fever, (3) dehydration, and (4) postoperative distention. Certain bizarre complications such as hemoptysis with expectoration of the splenic pedicle ligature have been described,[28] but are significant only as medical rarities. Vascular collapse is often imminent in congenital hemolytic icterus. In this condition severe hemolytic crisis may require emergency splenectomy. Torraca[29] cites eight cases of idiopathic postoperative fever which could not be explained on the basis of thrombosis, infection, or the absorption of products of necrosis. Dehydration and postoperative distention are other manifestations of altered physiology. Accessory spleens must always be sought, inasmuch as the original symptoms may be expected to continue when all splenic tissue is not removed.

*Treatment of complications.* The value of anticoagulants in postoperative thrombosis has not been conclusively established, although most authors are agreed that these agents should be employed.

Murray and MacKenzie[30] noted that thrombosis did not occur in a small group of splenectomized patients receiving heparin postoperatively. In 6 patients in whom thrombosis of the splenic vein had already occurred, the use of heparin prevented further thrombosis, although the mortality rate following resection was 33 per cent. Diamond[17] recommended deep roentgen therapy to the chest to reduce the platelet count. When peripheral thrombosis occurs, the treatment is not different from that usually recommended for this condition.

Careful selection of cases for splenectomy and adherence to the established indications are essential for the prevention of complications arising from hemorrhage. In addition, attention to surgical technique should include the following considerations: (1) the employment of an adequate incision, (2) careful dissection of the tail of the pancreas and identification of the stomach before ligating the pedicle, (3) individual ligation of the splenic artery before entering the pedicle, (4) ligation of all vascular and ligamentous attachments before delivery of the spleen, and (5) meticulous hemostasis. Except in congenital hemolytic icterus, the patient with anemia and dehydration should be prepared preoperatively with fluids and whole blood. Liver insufficiency should be offset with adequate diet, intravenous glucose, and Vitamin K. When postoperative bleeding occurs, transfusion, ligation of bleeding vessels, and aspiration of hematomas may be essential.

The treatment of infection requires little comment. Identification of the organism, selection of the proper antibiotic, and surgical drainage are principles which indicate the procedure to be followed.

Operative shock must be anticipated as a complication. Ligation of the splenic artery before ligation of the vein will prevent the loss of blood during the removal of the spleen, and such a procedure makes unnecessary the use of adrenalin to contract the spleen.

## Summary

New understanding of the physiology of the spleen has led to an appreciation of new indications for splenectomy. The morbidity and mortality rates for splenectomies in the treatment of primary splenic diseases have been materially reduced. The incidence of complications, however, continues to be high.

The physiology of the spleen is reviewed briefly, and a discussion of the indications for splenectomy is presented, with an account of the physiologic sequelae which may be expected. Emphasis is placed on the fact that all diagnostic facilities should be applied to determine whether a given patient with splenic disease requires splenec-

tomy. Particularly is the use of bone marrow studies in diagnosis encouraged, in order to rule out a contraindication such as agnogenic myeloid hyperplasia.

The available literature has been reviewed, and a report based on an analysis of 777 cases presents the complications found. The three most frequently encountered complications are thrombosis, hemorrhage, and infections.

Thromboses can best be treated by prevention. Anticoagulants and roentgen therapy are evaluated for this condition. Adherence to the established indications aids in prevention of hemorrhage. The administration of fluids and whole blood, as well as adequate diet with Vitamin K are cited as preventive measures. Considerations to be made regarding surgical technique are listed. In the treatment of infections the important principles to be remembered are identification of the organism, selection of the proper antibiotic, and surgical drainage.

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# SURGICAL MANAGEMENT OF CAROTID BODY TUMORS*

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THE carotid bodies are paired, 5 mm. sized organs found at or near the bifurcation of the common carotid arteries. The structures gradually develop up to the age of twenty or thirty, and then they become quiescent and begin to atrophy. They develop with the third mesodermal arch and are probably homologous to the adrenal medulla. The carotid body is usually attached to the internal carotid artery by a pedicle, the ligament of Mayer, through which it receives its normal blood supply. The fibrous capsule surrounding the structure is continuous with the pedicle and fibrous septa from the capsule divide it into lobules. The fibrous network contains medullated and nonmedullated nerve fibers which encircle groups of large, polyhedral cells. The bodies are exceedingly vascular and contain many sinusoids. From this collection of cells arises the interesting carotid body tumor which has its counterpart in the pheochromocytoma, coccygeal body, aortic body, and adrenal medulla tumors.

Von Haller, in 1743, first called attention to carotid body tumors. In 1866, Madyl and Gersuny each excised a tumor, dividing the three carotid vessels in each instance. Riegner removed one in 1880. In 1889, Albert was the first to excise one without sacrificing the carotid vessels. Since then, approximately 300 cases have been reported up to 1943. Hines Hospital reports four carotid body tumors in a series of 18,949 cases of malignant tumors during a 17 year period ending in 1948. We have had 8 cases in the past 10 years, 6 of which have come to surgery.

Grossly the tumors resemble the normal carotid body in shape, encapsulation, and lobulation. They vary in size from an egg to a large grapefruit. The carotid vessels are commonly encircled by the tumor. The most striking feature of carotid body tumors is their extreme vascularity. Microscopically, the pattern may be one of large islands of polyhedral, granular cells separated by small amounts of connective tissue and diffusely permeated with small endothelial lined capillaries. Another pattern frequently seen consists of small, irregular groups of cells separated by hyperplastic capillary endothelium. Areas of degeneration and hemorrhage are frequently found.

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Reports of malignant degeneration vary from zero to 50 per cent. Local invasion of the capsule and adjacent structures has been observed frequently, but distant metastases are unreported.

Carotid body tumors develop slowly, and are usually of five to six years' duration before they give rise to symptoms. The age incidence averages 45 years. The sex incidence is about equal. We have one case in which the familial tendency is demonstrated in that the father, three sisters, and two brothers had similar tumors. There is a second case in which a brother of one of our operated women had a similar swelling on one side of his neck. The tumors are predominantly unilateral, although in 2 of the 6 cases in the present series, the tumors were bilateral.

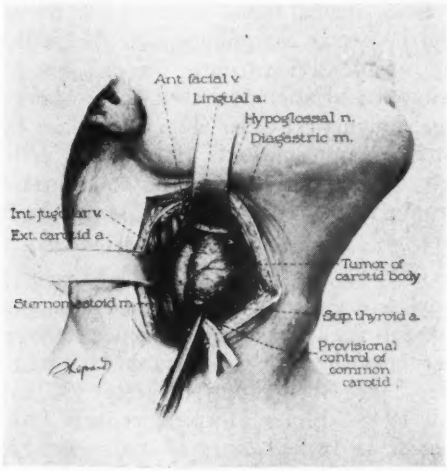


Fig. 1. Incision and exposure of carotid body tumor.

The diagnosis is often difficult to make preoperatively. Laterally placed, discrete tumors such as carotid aneurysms, branchial cysts, lipomas, tuberculous adenitis, lateral aberrant thyroids, and neurofibromas must be considered in the differential diagnosis. Secondary metastases from obscure primary carcinomas may give a similar picture. The overlying skin is free. A bruit, thrill, and transmitted pulsation is readily discernible in most instances. The tumor has a characteristic which has never been observed by us in any other tumor in this location; when it is compressed digitally for a few seconds and the pressure then quickly released, it will be found that the tumor slowly refills and assumes its previous outline. In aneurysms of the vessels in this region, the same manipulations would be followed by an immediate return of the tumor to its original

size when the pressure is removed. The tumors are located in the superior, anterior cervical triangle of the neck at the anterior border of the sternocleidomastoid muscle. They grow medially and cephalad, behind the mandible, toward the base of the skull. Mechanical displacement in a vertical direction is difficult because of its anatomical position, but lateral mobility is usually present. Involvement of adjacent structures, namely, the pharynx, esophagus, cervical sympathetic trunk, vagus nerve, recurrent laryngeal nerve, and internal jugular vein by invasion or compression may produce hoarseness, dysphagia, dyspnea, cough, and Horner's syndrome. The patient frequently seeks aid only for cosmetic purposes. Pain on turning of the head or in lifting heavy objects is a

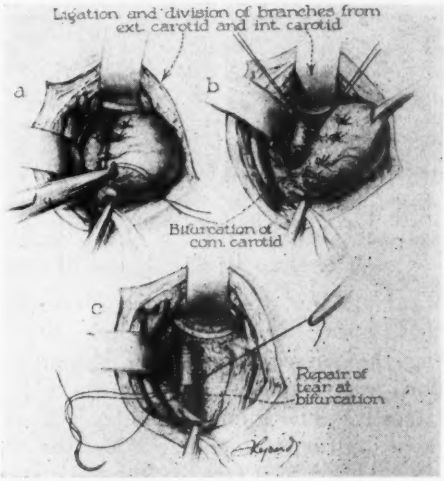


**Fig. 2. a, ligation of individual vessels going to the carotid tumor. b, external carotid retracted and internal carotid brought into view. c, suture of crotch is commonly necessary because of firm attachment at this location.**

common complaint. The pain is intermittent, sharp and shooting in character, radiating toward the ear on the affected side. Vasovagal syncope is rarely present.

The treatment of choice is surgical removal, particularly when the tumor interferes with swallowing or involves adjacent structures by pressure or invasion. Feasibility of the surgical approach depends largely upon the intimate relationship of the tumor to the carotid vessels. It is usually found to be like a saddle over the crotch of the carotid bifurcation.

If surgical removal necessitates ligation of the major vessels, the danger is greatly increased. Ligation of the common carotid artery

is followed by a disturbing mortality and a disabling morbidity. With ligation of the internal carotid artery, cerebral edema, anoxia, and necrosis of brain tissue develops rapidly. On the other hand, ligation of the external carotid alone can usually be accomplished without attendant morbidity.

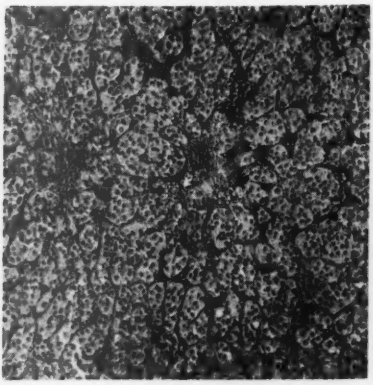

Fig. 3. Characteristic arrangement of compact groups of cells interspersed with numerous capillaries.

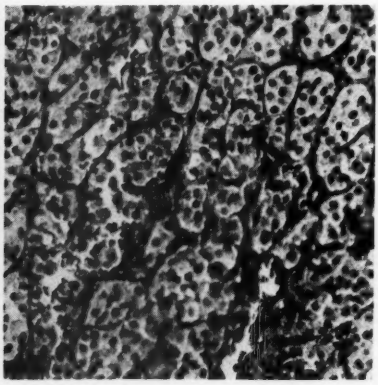

Fig. 4. High power section showing large polyhedral cells arranged in small alveolar units.

It has been our practice to make a transverse incision over the tumor following a normal crease of the neck. Occasionally, an incision following the anterior border of the sternocleidomastoid muscle will afford wider exposure. The sternocleidomastoid muscle is retracted laterally. The internal jugular vein is freed and its tributaries ligated in order to mobilize it and permit its retraction. The common carotid artery is freed below the mass and a flat tape placed about it as a provisional control. This tape may be tightened if it becomes necessary to limit the flow of blood through the vessel. It must be borne in mind that if the bleeding necessitates occlusion of the common carotid artery by temporary compression, this should not be maintained for more than ten minutes at a time. If the collateral circulation through the Circle of Willis is inadequate, temporary release should be allowed to prevent harmful effects to the brain which may occur. The external and internal carotid vessels are similarly freed and provisional tapes placed about them distal to the tumor. The mass is carefully dissected free from its position between the limbs of the internal and external carotid arteries. Communicating vessels are individually divided and ligated. This should be done with fine transfixion ligatures of silk because the tissues are extremely friable. Frequently a rent is made in the bifurcation of the carotid, at the site of the ligament of Mayer.

This may be successfully closed by a continuous silk suture without occluding the lumen of the vessels. All efforts are made to control bleeding from the major vessels, and to preserve the common and internal carotid arteries because of the forbidding mortality incident to internal carotid ligation.

In an attempt to decrease cortical degeneration, a high oxygen volume must be maintained with the anesthesia. In operations on carotid body tumors, one is constantly confronted with the possibility of having to ligate the common carotid artery. It has been established by several investigators that the possibility of encephalomalacia following carotid occlusion depends more on the character of the anastomosis in the Circle of Willis than it does upon the age of the patient or the site of ligation. Arteriography has improved to the point where it offers definite help in establishing the character of the cerebral circulation. People familiar with this problem have found it expedient to inject contrast media into the common carotid artery on the side opposite the lesion while compressing the artery on the same side. The appearance of the contrast media on the affected side will demonstrate the adequacy of the circulation through the Circle of Willis. If one is fortified with this information before surgery, one is in a better position to evaluate the possible consequences of ligation of the carotid vessels.

## SUMMARY

Carotid body tumors are among the rare tumors of the neck.

They usually grow very slowly and make their appearance in adult or middle aged persons.

Malignancy of these tumors has been described, but it is not a frequent occurrence.

Complete excision of the tumor is rarely followed by recurrence.

The diagnosis is difficult preoperatively and the tumor is most frequently confused with carotid aneurysm.

The carotid sinus syndrome, or vasovagal syncope of Lewis, was not present in any of our patients, and is apparently of rare occurrence in these tumors.

Injury of the common carotid artery at the site of the ligament of Mayer is the most common accident encountered in surgery of the carotid body tumor.

The value of establishing the adequacy of the Circle of Willis preoperatively cannot be too strongly recommended.

Provisional control of the common carotid artery and its main

branches should be completed prior to beginning the dissection of the tumor.

The type of anesthetic must be carefully considered and, with inhalation anesthesia, a high oxygen content is imperative.

The frequency with which cerebral damage follows carotid ligation compels one to approach this operation with caution. There is much of the same dread of hemiplegia here as there is the fear of facial paralysis whenever the parotid gland is resected.

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# LUMBAR LORDOSIS AS A SIGN OF CAUDA EQUINA TUMOR IN CHILDREN*

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ELSBERG,[1] in his volume on surgical diseases of the spinal cord, does not mention lordosis as a clinical or roentgenographic sign of tumor. Neither is the condition noted by Davis.[2] Grinker and Bucy[3] say, "Soft tumors of the cauda equina may fill the spinal canal with little neurogenic involvement except severe spasm of the hamstring muscles with shortening. These patients may be diagnosed as having orthopedic problems." Bagley and Arnold[4] have recorded the case of a 9 year old boy who had a large intraspinal lumbosacral cholesteatoma who showed slight kyphosis of the lumbar spine, a flexion deformity of the knees and hips, and no motor, sensory or reflex change. Bennett[5] reported the case of a boy of eleven who had a stiff, painful back and shortening of the hamstring muscles. For three years he was considered to have hysteria and it was only after paralysis of his legs occurred that a tumor was diagnosed and removed. Craig and Mitchell[6] recorded the case of an 8 year old boy who had nocturnal incontinence, painful back and lumbar lordosis, the degree not being stated. The knee jerks were absent, but there was no other sign of motor disturbance. There was a dimple over the fourth lumbar vertebra, and at operation a cholesteatoma was found extending from the eleventh dorsal to the fourth lumbar vertebra.

Recently, I have seen two patients at the St. Louis Shriners' Hospital for Crippled Children in whom exaggerated lumbar lordosis was the predominant symptom of intraspinal tumor, and, since one of these patients had been seen by excellent orthopedists who failed to recognize the underlying pathology, it seemed to me worth while to report these cases:

CASE 1. W. G., a girl of 11, was admitted to the Shriners' Hospital, St. Louis, Mo., on July 16, 1948, because of difficulty in walking. When she was 4-5 years old she complained of pain in both legs when playing, and would sit down frequently to rest. About 6 months later she began to walk on her toes, so she was taken to an orthopedic center where, after thorough study, biopsies were made of her back muscles, and she was put in a body cast, and long leg casts, for several weeks. The muscle biopsies were said to be normal. She was apparently improved for many months after the casts were removed, but her symptoms recurred, so at the age of 9 she went back to this hospital

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and casts were reapplied. There seemed to be some temporary improvement, but the symptoms soon began to progress and further aid was sought.

Case 1. Fig. 1. Definite increase in lumbar lordosis and inability to get feet flat on walking surface.

Examination showed no apparent disturbance of any of the cranial nerves, nor of the upper extremities. She had a marked increase in lumbar lordosis (fig. 1) and a peculiar gait consisting of a strong tendency to walk on her "tip-toes." Although the tendo-achilles appeared shortened, with the knees slightly flexed these tendons could easily be stretched to normal length. There was a flexion deformity of the right hip to 20°, and in the sitting position the knees could not be extended completely. The lordosis could not be straightened even with the hips flexed to 90°, and the back was classified as rigid from the orthopedic standpoint. No deep reflexes could be elicited in the legs, but there was absolutely no sensory change, hypotonia, atrophy, or sphincter disturbance. There was a small dimple in the skin over the upper sacrum in the midline, and x-rays of the spine (figs. 2 and 3) showed the exaggerated lumbar lordosis plus a spina bifida of the upper sacral and fifth lumbar laminae.

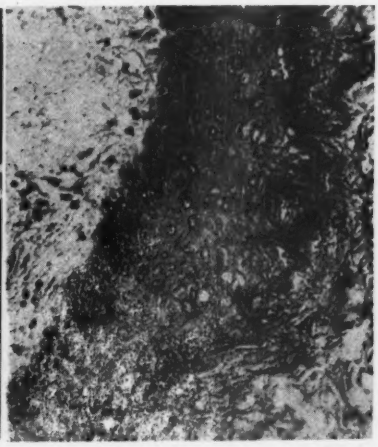
In order to determine whether there was a connection between the spina bifida and the patient's symptoms, pantopaque myelography was performed (fig. 4). There was a complete arrest of the opaque material at the level of the fourth lumbar lamina with a defect above this, suggestive of an irregular space occupying mass. The spinal fluid protein was 55 mgm. per cent. At operation a large epidermoid tumor both extra and intradural was removed. A stalk of the tumor extended out to the skin dimple, and this tract penetrated to the dura between the fourth and fifth lumbar vertebrae. There was considerable epidermoid material extradurally, but most of the limiting membrane was intradural and matted to the roots of the cauda equina. The tumor was

posterior to the cauda equina, all of the roots being crowded together in the anterior portion of the canal. The area of spina bifida was, as is usual, covered with a tough, ligamentous tissue.

Case 1. Fig. 2. Lateral spina x-ray showing the lordosis (patient was straightened as much as possible to make film).

Case 1. Fig. 3. Failure of fusion of first sacral lamina.

Case 1. Fig. 4. Complete arrest of pantopaque at fourth lumbar lamina with defect above on the right side.



Case 1. Fig. 5. Epidermoid tumor with typical "desquamated" epithelium. x155.

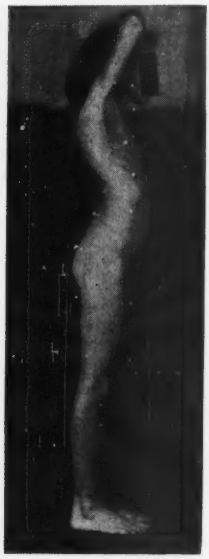
The child's postoperative course was uneventful except for a temporary difficulty in voiding. When discharged there was little change in the lumbar lordosis, but she was easily able to walk with her heels on the floor.

Sections show the tumor to be a typical epidermoid (fig. 5), containing in

addition to the usual desquamated epithelium long, well developed hairs. It weighed 29 Gm.

Since no previous case of a similar nature had been seen at this hospital where there is an abundance of orthopedic material, it was unusual that less than 6 months later the second patient appeared.

CASE 2. J. B., age 9, was admitted late in December, 1948, with the complaints of crooked back and pain in the left hip. About one year before, she began to complain at night of pain in the left thigh. Gradually the pain became more or less constant in the upper thigh and hip region, and she developed an increasing lumbar lordosis. She had been studied in several clinics, but no definite diagnosis had been suggested.



Case 2. Fig. 6. Marked lumbar lordosis.

Examination (fig. 6) showed a thin, undernourished child who was small for her age. She had an extreme fixed lordosis with a contracture of the left hip. She showed no involvement of the cranial nerves, upper extremities, or abdominal muscles. No sensory change could be made out, the leg reflexes were present, and there were no pathological reflexes. Sphincter control was normal.

X-rays of the spine were unsatisfactory (figs. 7 and 8) because of the lordosis, but there was an obvious widening of the pedicles of the second, third and fourth lumbar vertebrae.

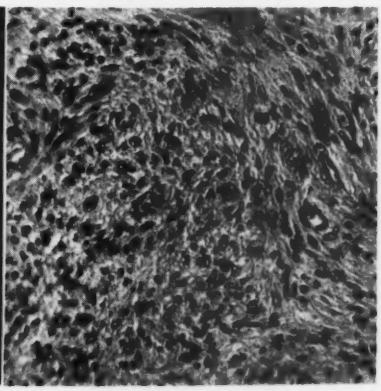
Spinal puncture showed a normal rise and fall on jugular compression, but the fluid was yellow with a total protein of 2840 mgm. per cent. Pantopaque myelogram (fig. 9) showed a complete arrest at the second lumbar vertebra,

with a V-shaped defect extending to the lower part of the third lumbar vertebra, suggesting that the material was flowing laterally around a tumor mass.

Case 2. Fig. 7. Lateral x-ray of spine. Marked lumbar lordosis.

Case 2. Fig. 8. Widening of spinal canal in lumbar area.

Case 2. Fig. 9. With patient's head lowered pantopaque is arrested completely at second lumbar, and is flowing around a mass in canal.



Case 2. Fig. 10. Characteristic whorl-like cellular arrangement of neurofibroma. x155.

Operation showed a large tumor mass beneath the second and third laminae. It was well encapsulated, but had to be removed in pieces because it was broader than the bone opening. The bony spine was peculiar in that the laminae were arched backward, the posterior curve including a part of the spinous processes. The lordosis was so marked that the lumbosacral fascia and some of the muscles had to be cut transversely in order to get exposure.

Sections of the tumor (fig. 10) showed a typical neurofibroma. It weighed 10 Gm. Her postoperative course was smooth with no sphincter involvement, and by the time of discharge, about 3 weeks postoperatively, she was walking without difficulty. The lordosis was still present.

It is interesting to speculate as to the etiology of this marked postural change. To me, it does not seem logical to assume that it bears any direct relationship to muscle function. It is true that the muscles chiefly responsible are supplied by the posterior divisions of the spinal nerves, but these divisions emerge from the parent trunk outside the intervertebral canal, and should not be in any way affected by intraspinal pressure. Personally, I believe it to be a defense mechanism. In both cases the tumor was posterior, the roots of the cauda equina being pushed into the anterior or ventral portion of the canal. Under this circumstance, an exaggerated lumbar lordosis would tend to minimize the root compression whereas straightening of the lumbar curve or an actual lumbar kyphosis would compress the roots even more.

Case 1. Fig. 11. Lordosis still evident six months after operation.

Case 2. Fig. 12. Lordosis still present six months after operation.

In any event, once the process is well established, permanent changes might easily occur, and this is borne out by 6 months follow-ups (figs. 11 and 12) on these patients. Both are doing extremely well in so far as any neurological symptoms are concerned, but from the photographs it is obvious that the lordosis persists. It will be

interesting to see if future normal growth will correct or minimize the deformity.

Obviously, consideration of the diagnosis of low spinal cord, or cauda equina tumor in a child with exaggerated lumbar lordosis is important. Since these tumors may exist for a long time in the absence of motor, sensory, or sphincter disturbance, myelography seems indicated if no definite cause can be found by other means.

## SUMMARY

1. Two cases of cauda equina tumor in children are reported.

2. In both cases exaggerated lumbar lordosis was the predominant symptom.

3. The lordosis has persisted for months after operation and may remain permanently.

4. Neurological signs were scanty, and diagnosis was established by myelography.

5. Both tumors were pathologically benign.

6. Myelography is advised in children with exaggerated lumbar lordosis if the causative agent is in doubt.

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# UTERINE BLEEDING: THE GYNECOLOGIST'S *BETE NOIRE**

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OF THE various problems which confront the gynecologist, one of the most complicated and perplexing is abnormal uterine bleeding. The causes of this condition are several, but it is apparent, as Meigs points out, that any interference with the normal structure of the uterus (as of the normal constituents of the blood) may be a cause of abnormal bleeding.[16]

For instance, blood clots because of calcium, prothrombin, and blood platelets acting together to form thrombin, an active coagulant. Thrombin with fibrinogen forms fibrin, the basis of the blood clot so that interference with any of the above constituents of blood may prevent clotting and hence cause abnormal menstrual flow.

However, Carmichael finds that approximately one out of every four women with abnormal uterine bleeding does not present either systemic disturbance or local disease to account for the bleeding.[6] Hence the term functional uterine bleeding designates uterine bleeding occurring in the absence of organic disease of systemic or local nature.

What then seems to be the causes of uterine bleeding—exclusive of normal menstruation? And what is normal menstruation? Royston believes normal menstruation to begin between the ages of 11 and 17 years, and to recur more or less regularly every 21 to 35 days for a period of one to eight days. Normal cessation occurs between the ages of 42 to 50 years; if between 35 to 42 it is called "early menopause"; if prior to 35, premature menopause.

We have the following to consider with regard to normal menstruation, anovulatory bleeding, adolescent bleeding, irregular bleeding of maturity, and bleeding during the climacteric.

Malignant tumors of the uterus and ovaries cause most anxiety and furnish the principal reason for a meticulous search to rule out such conditions.

In our endometrial biopsy clinic for the study of uterine bleeding the following was found:

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SUMMARY OF 107 CASES

| *Findings* | *Total Biopsies* | *% of Biopsies* |
|---|---|---|
| Proliferative Phase, Late and Early | 95 | 35.5 |
| Secretory Phase, Late and Early | 95 | 35.5 |
| Hyperplasia of Endometrium | 28 | 10.4 |
| Glandular Hyperplasia | 2 | .74 |
| Polypoid Hyperplasia | 2 | .74 |
| Endometrial Glandular Dysplasia | 3 | 1.08 |
| Cystic Glandular Dysplasia | 1 | .3 |
| Placental Tissue | 15 cases | 14% of cases |
| Malignant Adenoma | 3 cases | 2.8% of cases |
| Atrophic Endometrium | 23 | 8.6 |

In this study there were 75 white and 32 Negro patients and all came in primarily for irregular bleeding. There were 267 biopsies ranging from 1 to 24 biopsies per patient, or an average of 2.4. There were 15 cases, or 14 per cent, in which we found placental tissue present, but many of these patients gave no history of recent pregnancies. There were three cases of malignancy, or 2.8 per cent of the 107 cases. The ages of these were 26, 51, and 59 years. The youngest patient was 14 and the oldest 69 years. There was one granulosa-cell tumor in the group.

Benign uterine bleeding may be due to the following:

1) General circulatory diseases, such as cardiovascular diseases which result in chronic passive congestion.

2) Various blood dyscrasia such as thrombocytopenic purpura.

3) Specific infections such as syphilis and tuberculosis.

4) Endocrine dysfunction not associated with malignancies.

5) Postmenopausal vaginitis and cervicitis the common cause of "spotting."

6) Papillomas of the vagina.

7) Trichomonas vaginalis infection.

8) Urethral caruncles.

9) Endometrial polyposis in menopausal cases. Fibrosis uteri produce uterine hemorrhage when there is preponderance of fibrous tissue.

10) Submucous fibroids. Degeneration of intramural fibroids will produce benign bleeding. Hyaline and cystic degeneration with infection will frequently cause abnormal bleeding.[26] Weintraub found that the commonest cause of bleeding was fibromyomas; 46 per cent of patients admitted for gynecologic examination other than pregnancy.

11) Yeast vaginitis producing congested vaginal mucosa.

12) Stilboestrol bleeding after menopause occurring after administration of drugs for vasomotor disturbance and when the drug is withdrawn.

Other benign causes of bleeding in the post-menopausal individual are:

1) Hypertension.

2) Postirradiation tissue changes caused by use of radium or deep x-ray therapy will cause vaginal bleeding.

3) Change in climate from a cold to a tropical area brought on uterine bleeding in two patients,[21] Reich reports.

4) Procidentia uteri with decubitus ulcer of the cervix has been observed to be a cause for bleeding.

5) Endometriosis, adenomyosis, benign hyperplasia of endocervical epithelium caused bleeding in several of their patients.

6) Chancre of the labia minora has been considered a cause of bleeding.

7) Ulceration of vagina from improperly fitted diaphragm, and varicose veins of the vagina have been known to cause bleeding.[1] Benign postmenopausal bleeding usually occurs from senile vaginitis cervical polyps and other abnormal nonmalignant conditions.

The most common causes of obstetric hemorrhage in order of their frequency are:[11]

1) Postpartum hemorrhage.

2) Abortion.

3) Placenta previa.

4) Ectopic pregnancy.

5) Premature separation of the normally implanted placenta and rupture of the uterus. As an immediate cause of death in childbirth, obstetric hemorrhage ranks second both to puerperal infection and the toxemias of pregnancy.

Abnormal uterine bleeding may be a sign of endocrine disorder or ovarian dysfunction. Psychic factors may often result in excessive menstrual bleeding although contrariwise, amenorrhea may be the result of a psychic disturbance. Inquiry should be made as to whether the patient's complaint is something altogether new to her experience or if it resembles somewhat any similar episode in her past.[12] A recent period of overwork, intense emotional upset, or accident may be causes of uterine bleeding.[2] Blaikley summarizes eight cases of menorrhagia in which bleeding associated with emotional difficulties and a case of postmenopausal bleeding are of

psychogenic origin: "Such menorrhagia," he says, "is not uncommon, particularly in young women, and may be cured by simple psychotherapy."[4]

A thorough physical examination is very important in the determination of the real cause of genital bleeding. The examination must include inspection and bimanual palpation in addition to the laboratory examination of red and white blood cells, hemoglobin, sedimentation rate, urinalysis and metabolism. The cervix must be carefully inspected for growths, in many cases it is advisable to get a biopsy and occasionally curettage is indicated.[25] The age factor is an important one in considering genital bleeding.

The physician confronted by a patient complaining of abnormal bleeding will immediately think of the possibility of cancer particularly if the patient is beyond the menopause. A history of spotty intermenstrual bleeding should always arouse suspicion of cancer of the cervix regardless of the patient's age, for cancer of the cervix is a disease of the young as well as the middle-aged and old. However, many factors may account for uterine bleeding, and the physician must make a thorough investigation of his case, obtaining a complete history and laboratory picture before making a final diagnosis and prescribing treatment. The misguided use of estrogenic hormone preparations for the relief of real or alleged menopausal symptoms, no doubt, is contributed to the women who have marked menorrhagia or metrorrhagia as a result of the improper use of estrogens.[2]

Mussey found malignant lesions in 51 per cent of the cases of postmenopausal bleeding in women over 50 years of age.[17] Taylor and Miller found malignant lesions in 63 per cent of cases in which postmenopausal bleeding occurred. Phaneuf states that one-third of all cancers in females occur in the uterus (90 per cent in the cervix and 10 per cent in the fundus).[19]

Allen states that the patient with carcinoma usually, prior to menopause, will continue to have regular menstrual periods but may have excessive bleeding during the period. In a study of 4,000 patients prior to the age of 20, vaginal bleeding practically never indicates malignancy though it may occur. Of all the patients with abnormal bleeding in this age group, approximately 35 per cent have complications of pregnancy (primarily abortions), 35 per cent bleeding associated with pelvic inflammatory disease, 25 per cent functional bleeding frequently arising from ovarian dysfunction. The decade 20-30 years shows about the same distribution of disease though benign tumors begin to appear as a cause for bleeding. In the decade 30-40 in Allen's series, approximately 3 per cent had

carcinoma. As the age approaches menopause, frequency of malignancy increases but prior to menopause only about 10 per cent of the number is abnormal bleeding due to cancer of the cervix associated with myoma.[1]

In abnormal uterine bleeding of the younger group (before 40), hysterectomy should be considered only after other means of possible diagnosis have been carried out. Allen believes that one should hesitate a long time before giving the younger group roentgen ray or radium therapy. Radiologists agree with gynecologists that radiotherapy should be avoided even in carefully controlled doses designed to check the menstrual function only temporarily.[18] Radium therapy is contraindicated in most cases except those nearing menopause suffering from cervical polyps, and may well be used when the uterus is enlarged to more than 14 weeks pregnancy.[22] Radium treatment is recommended only when all conservative forms of treatment fail and more radical measures must be adopted to preserve the health or life of the patient.[20] Treatment that will restore regular cyclic bleeding warrants sincere consideration by the physician before he resorts to hysterectomy or to x-ray or to radium.[6]

Interesting to note are the results of using radiopaque medium in hysterography. The use of this procedure in a series of 104 patients with obscure uterine bleeding revealed a pathologic cause in the uterus in approximately 75 per cent of the patients.[27]

But how may we treat uterine bleeding when it is not malignant or due to obvious causes? The treatment of functional bleeding is similar in many respects in most institutions and depends on the severity of the bleeding and the age of the patient. Counseller reports that in the young adolescent with symptoms only of irregular bleeding that at least 50 to 60 per cent can be improved on thyroid extract medication only—as shown by Winther, Haines, Mussey and Drips.[7] Davis believes that no specific therapy is necessary in the adolescent as this type of bleeding usually disappears as the young girl passes through adolescence to maturity.

Anterior pituitary-like preparations are favored by many physicians in the treatment of functional bleeding since they contain follicle-stimulating and luteinizing properties particularly useful in the pituitary failure type of irregular bleeding. The growth of the primordial follicle is dependent upon the secretion by the anterior pituitary gland of a follicle-stimulating hormone, designated pituitary gonadotropin A. It is only one of the anterior pituitary hormones involved in the physiology of menstruation. The results of stimulation of the ovary by the pituitary gonadotropin A is the maturation of the graafian follicle, and elaboration by the latter of

a hormone known as estrogen which hormone influences the endometrium and also the anterior pituitary gland. Upon the endometrium, estrogen acts in such a manner that the endometrium increases in size, grows, proliferates. The endometrium reflects the activity of the ovary.

Pituitary gonadotropin B influences the mature graafian follicle and the result is ovulation approximately 12 to 14 days before the onset of menstrual flow.

The second ovarian hormone, progesterone, acts upon the pituitary gland and endometrium to inhibit the pituitary from further elaboration of gonadotropin B. The corpus luteum hormone, progesterone, is responsible for the endometrium becoming thicker, fragments being cast off.

Markee in his studies of the endometrial transplants in the monkey observed menstruation to be due to a change in hormone levels.

Substances now being used in regulation of functional bleeding are:

1) Chorionic or anterior-pituitary like hormones of pregnancy urine.
2) Progesterone.
3) Testosterone propionate.
4) Thyroid extract.
5.) Diethylstibestrol.
6) Pitressin in oil.

The pituitary gonadotropins have been used for cyclic stimulation of the ovaries, but have been available for experimental use rather than for clinical use. The employment of equine gonadotropin in stimulation of follicle maturation has proved a disappointment for they stimulate follicle maturation but will not produce ovulation in the woman with uterine bleeding.[5]

In handling a series of cases of functional uterine bleeding, patients were subjected to an initial curettage, establishing the diagnosis and instituting the simplest form of progesterone therapy. There has been a satisfactory response in approximately 42 per cent of all cases treated by them by a single curettage.[14]

Testosterone propionate is sometimes used in severe bleeding and is preferred by some to progesterone.[7]

Karnaky feels that the level of the estrogen in the blood is important as to the onset of bleeding; that at a certain estrogenic blood level a woman bleeds. Above this level she is amenorrheic such as before puberty and after menopause. Karnaky used rather

large doses of stilboestrol in control of cases of uterine bleeding. One technique is to give the substance directly into the anterior wall of the cervix, using a spinal needle and a 10 c.c. syringe. He claimed good results in the use of this substance.[15]

The use of thyroid in the treatment of functional hemorrhage has been popular for a considerable number of years.[23]

In certain cases of uterine bleeding, Karnaky has found the use of thyroid extract to be effective when used in this manner—one-fourth grain of thyroid every morning for four days and every fourth morning the dose is increased one-fourth grain until the pulse is 100-110, and kept at that rate for 12 months.[15]

Moehlig (1943) used pitressin in oil as a hemostatic agent in a series of cases of menorrhagia and metrorrhagia with uniformly good and rapid results. Intramuscular injection of this substance is followed by slow absorption and prolonged action as a vasoconstrictor. All of 10 cases responded with cessation of flow within 6 to 72 hours of the first or second dose. As a preventive of functional bleeding, he has used this drug successfully in a few cases by administration a few days before the expected onset of the menstrual flow.[23] Benson reported encouraging results when he used pitressin tannate in oil on 100 individuals; only 16 per cent failed to note a check of bleeding; 3 per cent ceased to bleed in 24 hours; 17 per cent stopped bleeding in 48 hours; 35 per cent slackened markedly in 48 hours.[3]

## Conclusions

1. Uterine bleeding, one of the gynecologist's most difficult problems. Classified functional when no pathological or physiological cause can be attributed to same.

2. Normal menstruation begins between ages of 11 and 17, occurs more or less regularly every 21-35 days, duration of 1-8 days. Normal cessation 42-50 years. Between 35-42 is called early menopause, prior to 35 premature menopause.

3. Summary of 107 cases studied with endometrial biopsies; equal numbers found in proliferative phase late and early and secretory phase, late and early. Seventy-five whites, 32 Negro patients in group studied. Total of 267 biopsies ranging 1-24 biopsies per patient covered, 2.4 average per patient covered, 15 cases (14 per cent) placental tissue found present covered, 2.8 per cent malignancy found present.

4. Benign uterine bleeding may be due to general circulatory diseases, cardiovascular diseases, blood dyscrasia, such as thrombo-

cytopenic purpura, specific infections such as syphilis and tuberculosis, endocrine dysfunction postmenopausal vaginitis and cervicitis, papillomas of the vagina, trichomonas vaginalis infection, urethral caruncles, endometrial polyposis, submucous fibroids, yeast vaginitis, estrogen withdrawal bleeding.

5. Some of benign causes: Hypertension, postirradiation tissue changes, change in climate, procidentia uteri with decubitus ulcer of cervix, endometriosis, chancre of the labia minora, ulceration of vagina.

6. Common causes obstetric hemorrhage: Postpartum hemorrhage, abortion, placenta praevia, ectopic pregnancy, premature separation of normally implanted placenta.

7. Psychogenic factors to be considered. Blaikley describes eight such cases.

8. Malignancy frequent lesion in post menopausal bleeding, 50 per cent in cases over 50 years of age. Functional bleeding probably causing 25 per cent.

9. One third of cancer in female occurs in uterus, 90 per cent in cervix and 10 per cent in the fundus.

10. Substances used in regulation of functional bleeding: Chorionic or anterior-pituitary like hormones of pregnancy urine. Progesterone. Testosterone propionate. Thyroid extract. Diethylstibestrol. Pitressin in oil.

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# DeQUERVAIN'S STENOSING TENDO-VAGINITIS AT THE RADIAL STYLOID PROCESS

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A RELATIVELY common and painful condition, called variously (1) DeQuervain's Disease, (2) Stenosing Tendo-Vaginitis, (3) Fibrous Tendo-Vaginitis, and (4) Tenosynovitis of the abductor pollicis longus and extensor pollicis brevis tendons at the radial styloid process, is frequently encountered in patients.

Though DeQuervain,[1] in 1895, is given credit for first reporting this condition, there appears in the thirteenth edition of[2] Gray's Anatomy in 1893 a reference to a strain of the extensor muscles of the thumb, from excessive use, producing a peculiar sausage-shaped swelling along the course of the tendon and giving rise to a crackling sensation to the finger. This is called "Washerwoman's sprain." It seems likely that this may be the same condition described by DeQuervain. Originally DeQuervain reported 5 cases, all in women. Welti[3] in 1896 reported a case successfully treated by extirpation of the tendon sheath. Keppler[4] in 1917 reported 25 cases, and concluded that the pathology was a chronic inflammatory reaction in the tendon sheath caused by repeated aseptic irritations. Eschle[5] reported 110 plus 19 of his own, all relieved by surgery. In 1927 Winterstein[6] reviewed all previously reported cases numbering 140 and adding 19 of his own, and stated that the condition was present in females as compared to males in the ratio 10:1.

Little or no recognition was given the condition in American literature until Stein[7] in 1927, reported 5 cases. Schneider in 1928 published an article entitled "Stenosing Fibrous Tendo-Vaginitis over the Radial Styloid (DeQuervain)." Finally, in 1930, Finkelstein[8] reported 24 cases in the *Journal of Bone and Joint Surgery* in an excellent article entitled "Stenosing Tendo-Vaginitis at the Radial Styloid Process."

## ANATOMY

The abductor pollicis longus and extensor pollicis brevis tendons run in a common osseofibrous compartment on the outer side of the radial styloid process. The roof of this compartment is composed of a deep layer of longitudinal fibers and strengthened by a superficial layer of transverse fibers from the dorsal carpal ligament.

The sheath measures a little over 2 inches in length. Beneath the

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sheath lies the synovial membrane which is invaginated at the margins of the sheath and closely invests the tendons. Superficially beneath the skin, dorsally lies the superficial branches of the radial vein and nerve.

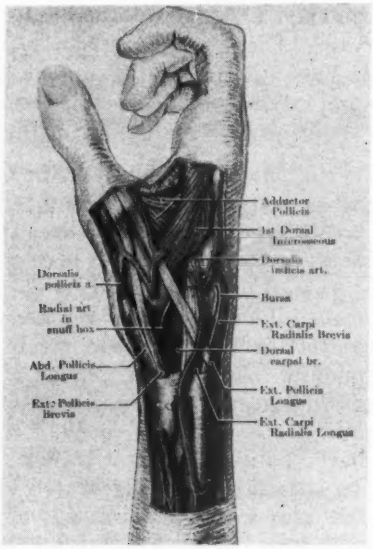


Fig. 1. (From Grant's Atlas of Anatomy.)

## Etiology and Sex

The condition appears to be far more common in females of middle age. Trauma of a minor nature is usually present in the history, but occasionally may be absent. Chronic low grade trauma such as seen in labors requiring a monotonous use of the thumb, as in wringing out clothes or typewriting, is often present.

In other words, any procedure causing mechanical attrition of the tendons within the sheath resulting in irritation will cause it. Sometimes direct trauma such as a blow over the tendons may cause it. Finkelstein reproduced the condition in rabbits by mechanical and chemical trauma. Syphilis and tuberculosis have been definitely excluded as causes.

### *Symptoms*

The onset is usually insidious following some task or household procedure involving use of the thumb. Rarely the onset may be acute. The patient complains of pain or tenderness on certain

motions of the thumb, over the radial styloid process which radiates to the thumb and proximally up the forearm. The pain may become quite severe and disabling.

Objectively, there is marked pain on abduction of the thumb, and a sign which may be called pathognomonic is to grasp the thumb holding it in abduction and suddenly deviate the hand in an ulnar direction. This will produce extreme pain over the radial styloid and along the course of the abductor tendon. There is usually tenderness on palpation over the radial styloid process. Swelling may rarely be present and cause obliteration of the anatomical snuff-box. X-rays are invariably negative, though at times slight calcification in the region of the radial styloid has been reported.

### Differential Diagnosis

Periostitis, arthritis especially of the rheumatoid type, sprains of the wrist, ganglions, tuberculous tenosynovitis, fractures of the radial styloid process, and fractures of the carpal navicular must all be ruled out in the differential diagnosis. X-rays will usually exclude most of these, though at times more extensive diagnostic procedures must be done.

### *Pathology*

In general the cases may be roughly divided into severe and mild cases.

In the mild cases, the symptoms may be minimal. Grossly, the tendon sheath is a little thickened, the tendons are slightly compressed beneath the sheath. No effusion is present and little or no inflammation is present. Microscopically, the ligamentous layer is thickened, the loose connective tissue layer is somewhat edematous and vascularized. The synovial membrane is thickened, but may be very thin at the point of maximal constriction.

In the severe cases, grossly, the ligamentous layer may be three to four times thicker than normal. It may be fibrous, cartilaginous or showing evidence of hyaline degeneration. Adhesions may be present between the tendons and sheath. The tendons are compressed beneath the sheath and expanded beyond it. Sometimes the tendons may be frayed or split. Microscopically, the synovial membrane may be completely destroyed and absent within the sheath. The loose, connective tissue layer is thinned out, and the ligamentous layer, which may be cartilaginous or undergoing hyaline degeneration, is greatly thickened. There is usually a lymphocytic round cell infiltration or mild inflammatory reaction.

It is interesting to note that a similar condition may affect other

Fig. 2. Case No. 4. Thickening of ligament and inflammatory reaction.

tendons, namely, the extensor carpi ulnaris, the extensor pollicis longus and the flexor pollicis longus. Zadek[13] reported 2 cases in infants in which the condition affected the flexor pollicis longus tendon causing a fixed deformity with the distal phalanx being flexed on the proximal phalanx and simulating a dislocation.

*Treatment:* In general the treatment is: (a) nonoperative, and (b) operative.

Nonoperative treatment consists of primary immobilization in a cast with the thumb incorporated in a position of abduction, for from six to eight weeks. Statistically, cures ranging as high as 70 per cent have been reported in early cases with this method. However, most observers feel this percentage is entirely too high. At any rate, in cases seen early, a trial with cast immobilization may at times effect a cure. Physical therapy including local heat, massage and liniments is without benefit.

The surgical treatment is so universal in effecting a cure and is so simple that it would seem the treatment indicated in the majority of cases.

Under local procaine infiltration anesthesia, a skin incision over the abductor pollicis longus and extensor pollicis brevis tendons is made. The incision has its center over the tip of the radial styloid process and is about 3 inches long. The superficial branches of the radial vein and nerve are picked up dorsally in the subcutaneous tissues and retracted. The dissection then proceeds to the tendon sheath and its proximal and distal margins identified. It measures a little over 2 inches in length. A probe is passed beneath the sheath and over the tendons. A definite block may be felt. The sheath is

then incised along the course of the tendons. In some cases a complete or partial resection of the sheath may be advisable. Generally the patient experiences immediate relief and is symptom free on moving the thumb. The skin is then closed with interrupted silk sutures and a firm dressing applied.

Postoperatively the patient is encouraged to start moving and using the thumb a little, after four to five days. As a rule patients are symptom free in two to three weeks.

### Presentation of Cases

Case 1. A 29 year old mechanic developed insidious onset of pain at the base of the right thumb five months previously. The symptoms were not very severe at first, but steadily increased in severity. He finally saw his local physician who took x-rays which were negative. He was also given a lotion to rub on the hand without benefit. Later a thumb plaster spica was applied with no relief. Examination revealed pain on palpation in the anatomical snuff-box and over the course of the abductor pollicis longus and on ulnar deviation of the hand. At operation a thickened tendon sheath was found over the abductor pollicis longus and extensor pollicis brevis. This was incised. The patient was cured.

Case 2. A 39 year old housewife gave a history of numerous painful joints, which were swollen at times, during her pregnancy one year earlier. Following the termination of her pregnancy, which was complicated by a toxemia, all of the joint symptoms cleared up with the exception of the right wrist. She described the pain as being present at the base of the thumb, associated with movement of the thumb, especially abduction. The pain radiated up into the forearm. The patient had been treated with numerous conservative measures including immobilization in cast for six weeks without relief. On examination the patient voluntarily splinted the thumb in fear of pain. Abduction and extension of the thumb were extremely painful over the course of the abductor pollicis longus.

At operation a chronically thickened sheath over the abductor pollicis longus and extensor pollicis brevis tendons was found. The roof of the sheath was excised. The patient was cured.

Case 3. A 31 year old housewife developed pain on the radial aspect of the left wrist six months before. There was no specific injury, but the patient believed she often struck her thumb and wrist during her household duties. On examination there was slight swelling over the radial styloid on the left, also tenderness along the course of the abductor pollicis longus tendon to palpation and pain on abduction of the thumb. At operation a thickened, stenosed tendon sheath was found over the abductor pollicis longus and extensor pollicis brevis tendons. Also present were adhesions between the sheath and tendons. The sheath was incised. The patient was cured.

Case 4. A 63 year old housewife gave history of pain at the base of the right thumb for three weeks. The patient had been actively engaged in wringing out clothes frequently. The wrist was immobilized for two weeks in a cast without benefit. Examination revealed tenderness to palpation over the abductor pollicis longus tendon and radial styloid. Also the patient complained of a tender area at the base of the proximal phalanx and distal end of

the first metacarpal over the extensor pollicis longus. There was exquisite pain over the radial side of the wrist on quick ulnar deviation of the hand. The pain radiated up into the forearm. Abduction of the thumb was the most painful movement.

At operation a thickened tendon sheath with evidence of a mild inflammatory reaction and adhesions between the sheath and tendons was found. The abductor pollicis longus and extensor pollicis brevis tendons were compressed beneath the sheath. The roof of the sheath was excised (fig. 1). After two weeks the thumb was painless on abduction, but she still had a small area of tenderness dorsally over the extensor pollicis longus tendon at the distal end of the first metacarpal.

## SUMMARY

1. A description of stenosing tendo-vaginitis, in the region of the radial styloid process and involving the abductor pollicis longus and extensor pollicis brevis tendons, first described by DeQuervain in 1895, is made. A review of the literature on the subject is given.

2. The anatomy of the tendon sheath in the region of the radial styloid process and enveloping the abductor pollicis longus and extensor pollicis brevis tendons is discussed. The etiology, namely, frequent trauma and the predominant occurrence in females is brought out.

3. A discussion of the symptoms including pain and tenderness over the abductor pollicis longus tendon, and over the radial styloid process, especially on abduction of the thumb, is given.

4. The chief conditions to be ruled out in the differential diagnosis are mentioned.

5. The pathology including the gross and microscopical similarities and differences between the mild and severe cases is presented.

6. The treatment is divided into: (a) nonoperative and (b) operative. A plea is made for the operative treatment because of the excellent results obtained and the simplicity of the surgical procedure.

7. Finally 4 cases are presented.

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# CARCINOMA OF THE CERVIX*

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THERE has been little improvement in the five-year survival rate of carcinoma of the cervix in the past twenty years. Reported variations in this rate are found on close analysis to be more apparent than real. Unfortunately, much of the recent literature on this subject appears to have been written in an effort to show that the authors' technics and procedures give improved results, and both the statistical data and conclusions drawn are so apparently forced that little of scientific value can be gained from their study.

Many reports eliminate from consideration all patients who cannot be followed up. Others use various reasons to eliminate many nonsurviving patients. We have found that when patients could not be traced, a record of their death could be obtained from their State Department of Health.

I recently read a report of results with high voltage x-ray and radium which showed above 90 per cent cures in stage I and 70 per cent cures in stage II. Although the clinic treated over 400 patients, only about one-third were reported, as the others were considered unfavorable. If from the charts shown in our series, multiple malignancies, patients of extreme age and patients having other serious diseases were eliminated, any desired cure picture could be obtained.

TABLE I

*Five Year Survivals—West Georgia Cancer Clinic*

| All | I | II | III | IV |
|---|---|---|---|---|
| 22.9 per cent | 50 per cent | 23 per cent | 5.5 per cent | 0 |

Principal large American and European Clinics—20-40%-High figures are corrected.

Connecticut State Department of Health

| I | II | III |
|---|---|---|
| 31.5 per cent | 25.9 per cent | 4.5 per cent |

All Georgia State Aid Clinics—all stages—20 per cent.

Corrected statistics to me appear worthless and should be refused publication by all reputable medical journals. Only through gross survival rate by stage can any accurate comparison of methods of treatment be made.

*Presented during the Washington Assembly of The Southeastern Surgical Congress, March 6-9, 1950.

Fortunately, however, some of the recent work on this subject has been carried out in the best possible manner and reported improvements in both radiation and surgical technics separately and combined hold a promise that better end results can be obtained for these patients.

Masson and Judd[1] outline a combined technic of irradiation and surgery which appears to offer improved results in selected cases. The improvement reported certainly suggests that this method should be given a more extensive trial.

There are many good methods of applying large doses of radiation uniformly to the cervix and parametrium by use of radium. The technic which has recently given us the best apparent results in most cases is by the use of the Ernst[2] applicator or some similar arrangement of radium units.

Brunschwig[3] by complete excision of the pelvic viscera has pointed the way to what appears to be the best means of relieving suffering in advanced cases. A few permanent cures may result. We have carried out the procedure in 7 cases. There have been two operative deaths. One patient is living and well after almost two years. One is living after two months. The remaining cases lived variable times up to six months. These patients all improved physically and mentally and were remarkedly free from pain. We have considered the results worthwhile, so have the patients.

Other workers in biochemistry, radiology, pathology and the clinical branches have added materially to our knowledge of this subject. However, the only thing which promises to increase materially the overall cure rate in this condition is the promise of earlier diagnosis and treatment through cytological diagnosis, education, both lay and medical, and the wide distribution of well equipped clinics with interested and trained staffs. However, the deaths can be reduced more than 6 per cent by eliminating the useless occurrence of carcinoma in the cervical stump.

For many years I have doubted that childbearing had any connection with the occurrence of carcinoma of the cervix. Through various agencies an unsuccessful effort was made to find what proportion of women in the carcinoma of the cervix age were nulliparous. The following statistics were gathered locally:

From 1937 to 1950 we have treated 198 patients. One hundred and seventy-four had borne children, while 24 were nulliparous. In this group, 16 of these women had previously had a subtotal hysterectomy. Twelve of these had borne children, while four were nulliparous.

In a survey made by the Field Army Workers of the Troup County Unit of the Georgia Division of the American Cancer Society, 1,315 women over the age of 35 were interviewed. One hundred and forty-five of these women had never had children. One thousand, one hundred and seventy had borne one or more children. This shows that 12.5 per cent of these women over 35 years of age were nulliparous. The percentage of nulliparous women in our cancer of the cervix series was 12.2 per cent. An additional series of 659 women from the ages of 16 to 35 employed in one industry showed 129 or 18 per cent had never had children.

While the number of women in the cancer of the cervix series and also in the survey is too small to allow a definite and final conclusion to be drawn, the results suggest strongly that childbirth and consequently lacerations at childbirth do not play any important role in the causation of cervical cancer. These results are certainly sufficiently conclusive to remove nonchildbearing from the reasons for leaving the cervix when performing a hysterectomy.

Six per cent of the loss of life from cancer in this series would have been eliminated if a complete removal of the uterus had been performed.

As no surgeon or clinic is able to follow up for a long period of time all patients who have had subtotal hysterectomies, the comparative incidence of carcinoma in the cervical stump is necessarily an estimate and cannot be accurately and positively stated. However, from available information it can be safely stated that these women run over twenty times the average risk of developing carcinoma in the residual portion of the uterus. The development of cancer follows so quickly after partial surgery in some of these cases that it is reasonable to assume that it is present at the time surgery is performed. In most instances there is a considerable interval and in these cases no adequate explanation can be given, except that the organ was diseased or no previous surgery would have been necessary.

Figures on the average mortality rate of total and subtotal hysterectomies available certainly do not give accurate information. As included in the total hysterectomy mortality are the results following radical pelvic surgery. On carefully analyzing results in our hospital and eliminating radical pan hysterectomies from the total group and also eliminating cases where a subtotal hysterectomy was done because the condition of the patient demanded the least possible surgery, I have been unable to find any appreciable difference in the mortality rate.

Where there is no gross disease of the cervix, a technic which

may be designated as a minimal total hysterectomy may be performed. This operation does not increase the mortality. It takes only a few minutes more time and two additional stitches. It does not shorten the vagina. It approaches no closer to the ureters or bladder than the usual subtotal operation. It can be not only more easily performed than an adequate cauterization or conization, but also be performed with less liability to postoperative hemorrhage and other complications. By removing a possibly infected cervix, the morbidity is diminished.

The following technic is followed: The usual procedures followed in performing a subtotal hysterectomy are carried out until the uterine arteries are divided. Following the division of the uterine arteries, clamps are placed including in their bite the uterine attachment of the utero sacral ligaments. It is not necessary to use double clamps as there will be no bleeding when the small remaining portion of the lateral attachment of the uterus is divided. After this is divided, an incision is carried completely around the cervix at a level with the tips of the clamps. To make sure the upper attachment of the cervical fascia is divided this incision should be deep enough to go into the uterine muscular tissue. Now if hard traction is made on the fundus, the line between the cervix and cervical fascia can be seen. Small vessels form a lateral attachment on each side. When these are divided while hard traction is exerted on the fundus, the cervix slides up and the cervical mucosa becomes everted. A small right angle clamp may now be placed beneath the cervix and the operation completed. If large tumors or cysts are present a subtotal removal may be done at a convenient level and the operation completed after good visibility has been obtained.

Certainly where what I call a minimum total hysterectomy is performed, there is no reason to suppose that the hazard to the patient will be increased and it is certain that by removing the cervix, many patients can be saved from death due to cancer developing in the cervical stump.

Except in unusual cases, I do not believe that subtotal hysterectomies should be performed.

## Conclusion

Childbirth and lacerations do not appear to be significant as causative factors in cancer of the cervix. If the cervix is removed in all possible patients who have hysterectomies, approximately 6 per cent of the deaths from carcinoma of the cervix can be eliminated.

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# MEDIASTINAL TUMORS*

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THE purpose of this paper is to discuss in a general way the symptomatology, diagnosis and treatment of mediastinal tumors. The opinions are based upon an exhaustive study of the literature and a study of 50 cases of mediastinal tumors.

All primary mediastinal tumors should be removed with no delay. Any mediastinal tumors of questionable origin whose diagnosis cannot otherwise be made promptly deserve exploratory thoracotomy with removal or biopsy. Procrastination has no place in the treatment of mediastinal tumors. Such delay was justified some years ago when the mortality associated with thoracotomy was high. Today, however, with the mortality of thoracotomy less than one per cent there is no justification in such action.

Primary tumors of the mediastinum will become malignant in as high as forty per cent of the cases if they are not removed early. Of the remaining sixty per cent a large number will be a contributory cause of death. If such tumors are removed before symptoms arise, the percentage of malignancy is much less. One is never justified in waiting for symptoms to appear.

If, on the other hand, all tumors of the mediastinum are considered, about eighty per cent will be malignant.[18] Because of this, a presumptive diagnosis is not sufficient. An early positive diagnosis must be made in order that adequate treatment can be carried out without delay. Surgical removal or direct biopsy by thoracotomy is often the only way to arrive at an accurate diagnosis and thus offer the patient early treatment as well as a sound prognosis.

Anatomists divide the mediastinum into a superior and an inferior division. The latter is then subdivided into anterior, middle and posterior parts. For the sake of simplicity, I shall divide the mediastinum into three parts: anterior, middle and posterior.

The anterior mediastinum normally contains the thymus gland, some lymph nodes, adipose tissue, and the internal mammary vessels. Tumors found in the anterior mediastinum frequently do not arise from tissue normally present. Tumors such as goiters, celomic cysts, and parathyroid tumors are extensions of tumors arising in

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other parts of the mediastinum or neck. They may represent growth of misplaced tissue. Teratomas and dermoid cysts probably arise from embryonic cell rests that are found in the ventral line of fusion.[14,44] Tumors of the thymus and lymph nodes arise from tissue normally present.

If one is to consider hyperplasia of the thymus as a tumor, this lesion is the most common mediastinal tumor found in infants and children. In a survey of one children's hospital, it was noted that over eight per cent of the children admitted had an enlarged thymus gland.[90] Many thymic tumors are asymptomatic, some are associated with a syndrome known as status thymic-lymphaticus,[166] while others may become malignant. Some authors have noted that the most common malignancy found in children is a lymphosarcoma arising from the thymus gland.[28,45] Thymic enlargements in adults have caused a great deal of interesting speculation.[5] The association of thymic enlargement and myasthenia gravis is well known, but poorly understood.[47,48,26,169,59,27,149,75,128,41,42,101] Since little is known about the pathology of the gland and even less about the physiology one must surely expect a poor understanding in diseases of the thymus.[63,134,62,19,26] Thymic enlargements may be associated with exophthalmic goiter, leukemia, Hodgkin's disease, and other systemic diseases.[111]

True tumors of the thymus have a high incidence of early malignancy.[63] Consequently, all thymic enlargements deserve surgical exploration unless they represent hyperplasia in an infant or unless the enlargement is part of a generalized disease.

Celomic cysts arise as out-pouchings from the pericardial sac which extend into the anterior mediastinum.[111] These cysts are uncommon, only four having been reported in the literature. They are usually asymptomatic and very rarely malignant. They can be removed without difficulty.

Teratoid tumors may be asymptomatic. The symptoms that arise are due either to pressure or to infection. In our series, one out of three of these tumors was malignant. It must be stressed that early removal of this type of tumor is imperative because of the high incidence of malignancy and infection associated with these tumors.[64] In a review by Rusby, including 209 cases, it was noted that 95 per cent of such tumors will contribute to the death of the individual. The average length of life of untreated patients after the onset of symptoms was less than two years.[150]

Intrathoracic thyroids are, in most instances, extensions from the gland in the neck.[47,107,108] They represent about one per cent of the

all nodular goiters.[102] They may or may not be toxic.[50] Occasionally thyroid tissue may be found in the anterior or posterior mediastinum not associated with the thyroid gland. Since intrathoracic deposits represent nodular outgrowths of the thyroid gland the incidence of malignancy has been reported as high as 24 per cent.[47] Such tumors should be removed because of the danger of toxicity or malignancy.

Lipomas of the mediastinum are of three types; those confined to the mediastinum, those of the collar button type that extend through the chest wall, and into the subcutaneous tissue, and those that arise in the mediastinum with extension into the neck. By x-ray they are difficult to distinguish from surrounding lung tissue because they are of nearly the same density. Although they are rarely malignant, they attain a large size and often cause severe pressure symptoms. Such tumors should be removed when they are small, as the mortality from removal rises as the tumor progresses in size.[89] Forty-two such cases have been reported in the literature.[90]

Fibromas of the mediastinum have a marked tendency to undergo sarcomatous change and should be removed early. They are usually easily diagnosed as they are much denser than the surrounding lung tissue and stand out well in the x-ray film. Of the 32 cases reported, 14 were operated upon with one death. The 18 not operated all died of sarcoma.[90]

Parathyroid tumors are relatively rare.[46] In a review of 322 cases of hyperparathyroidism only 19 tumors were found in the mediastinum. Ninety per cent of all parathyroid tumors are associated with clinically recognizable lesions of osseous tissue.[40] Because of this, these tumors should be surgically removed even though the incidence of malignancy is small. Primary or metastatic tumors of the lymph nodes of the anterior mediastinum are rare.

The mid-mediastinum, as described by the anatomists, contains only the pericardial sac and its contents. From the clinical standpoint, however, the ascending aorta and its immediate branches, the hilar lymph nodes, the trachea, and the pulmonary vessels are included.

Tumors arising in this region are most frequently enlargements of the lymph nodes. These nodes have direct drainage from the lungs, pleura, pericardium, thymus, thyroid, heart, esophagus, liver, diaphragm, and kidneys, and as a result act as a cesspool of lymphatic drainage. We can expect, therefore, secondary deposits of tumors arising elsewhere to frequently be found in the mid-mediastinum. Many tumors of this region actually represent a manifestation of disease elsewhere in the body. Oftentimes the first nodes to

enlarge in tuberculosis, Hodgkin's disease, and lymphosarcoma are seen in this portion of the mediastinum.[92]

X-ray has been used both as a therapeutic and a diagnostic agent in Hodgkin's disease and lymphosarcoma. It is our opinion, however, and the opinion of our colleagues, the hematologists,[178] that this is not justified. If we are presented with a case of enlarged mediastinal lymph nodes, the cause of which is not apparent, either by the enlargement of peripheral lymph nodes or by tumors elsewhere, or by changes in the peripheral blood picture, we have no hesitancy in exploring the mediastinum for the removal or biopsy of the lymph nodes. This procedure has the advantage of obtaining a definite microscopic diagnosis. The diagnosis is made early and proper therapy can be started immediately. If, on the other hand, one depends upon x-ray for the diagnosis it may be many weeks or months before a definite diagnosis is made and valuable time may have been lost. In some cases the diagnosis remains a question indefinitely. Cases of Boeck's Sarcoid, histoplasmosis, and coccidioidal granuloma have been seen that had been erroneously diagnosed as Hodgkin's disease. Mediastinal biopsy produced the proper diagnosis although all other diagnostic measures were equivocal. I would like to emphasize at this point that exploratory thoracotomy in the hands of a well trained thoracic surgeon is no more hazardous than is laparotomy in the hands of a well-trained abdominal surgeon.

Tumors of the heart and pericardium are rare. Aneurysms arising from the ascending aorta are often seen in the mid-mediastinum and frequently extend into the anterior mediastinum. As a general rule, anterior aneurysms are seen to the right of the mid-line and the posterior aneurysms are seen to the left. Many aneurysms do not pulsate. It has been pointed out that tumors adjacent to a normal aorta are much more likely to pulsate than is a diseased enlarged aorta.[11,12,13]

Bronchial cysts, gastric cysts, and enteric cysts arise from cell rests resulting from the splitting off process of the trachea and lung buds from the foregut. They are most frequently seen in the mid-mediastinum, but also may be found in the posterior mediastinum. They may be associated with the trachea or the esophagus and they may contain any of the components of the trachea or gastrointestinal tract. They rarely undergo malignant change and are often asymptomatic. Symptoms are a result of either pressure or infection. Occasionally in cases of gastric cysts, an ulcer may form, resulting in bleeding or in perforation with severe infection.

The most common of these tumors are bronchial cysts.[111] Thirty-

five such cases have been reported in the literature, together with 23 cases reported from the Army centers in a three year period during the last war.[22] At least 12 cases have been operated, all with good results.

Gastric cysts are more common than enteric ones. Fourteen such cases have been reported. Though the reports are vague, most of the gastric cysts have been found in infants or small children. Some were asymptomatic, several caused the death of the child, and several were removed with good results.[111]

Enteric cysts are of four common types: esophageal, gastrointestinal, intestinal, and tracheo-esophageal. Up to 1945 only 5 such cysts had been reported. Three cases of enteric cysts had similar cysts in the abdomen. This supports the theory that these growths arise from the ophthalmomesenteric duct.[111] They are often found in infants. While these cysts may be asymptomatic, they often cause symptoms either because of infection or pressure which may prove fatal. Early removal is imperative.[120,156]

The posterior mediastinum contains the descending aorta, the azygos and hemiazygos veins, the vagus and sympathetic nerves, the esophagus, thoracic duct, and some lymph nodes. The most common tumors of the posterior mediastinum are neurogenic, of which there are three types: neurofibromas, ganglionuromas, and neurolemmomas. The most common variety is the neurofibroma. Neurogenic tumors are easily diagnosed and easily removed. They should all be removed immediately upon being diagnosed. Forty per cent of such tumors will become malignant if they are not removed. There have been 135 neurogenic mediastinal tumors reported.[22]

Aneurysms of the descending aorta are occasionally confused with other posterior mediastinal tumors and offer the same diagnostic problems as they do elsewhere in the chest. Lesions of the esophagus are sometimes confusing, but as a general rule these can be easily diagnosed by barium study.

Tuberculomas of the mediastinum are uncommon, only one having been reported in the literature.[72] Echinococcus cysts usually occur in the lungs but have been reported in the mediastinum. Seven such cases were reported with extension through the intervertebral foramen and pressure on the spinal cord.[90]

## Symptoms, Laboratory and Physical Findings

Many mediastinal tumors are asymptomatic. Symptoms are of three types: infection, pressure on adjacent mediastinal structures, and pressure on nerve roots, or the spinal cord. Infection is of two

types: (1) of the tumor itself, as seen in cysts and teratoid tumors, and (2) of the surrounding tissue such as pneumonitis, mediastinitis, and empyema. In either type there is fever, malaise, dyspnea, tachycardia, and in some cases extreme lassitude. Such patients may be extremely ill. They may have a productive cough and chest pain.

Pressure on adjacent structures may cause cough, hoarseness, dyspnea, dysphagia, palpitation, pain and edema. Pressure on nerve trunks can cause pain, hoarseness, cough, dyspnea, Horner's syndrome, and paresthesia. Spinal cord pressure may cause complete paralysis or may cause only pain and changes in sensation.

The most common symptom is cough. Cough may be due to compression or deviation of the trachea, to pressure on the parasympathetic nerve fibers, to infection such as pneumonitis or bronchitis with or without bronchial stenosis, or to bronchopleural fistulæ. Pain is caused by parietal pleura involvement, pressure on the sympathetic trunk, involvement of the intercostal nerve, mediastinal shift, or spinal cord compression. Though visceral pain sensation is carried by the sympathetic trunks, the sympathetics to the lung have no pain component. Dyspnea may be due to tracheal deviation, fluid, formation, toxemia, atelectasis, compression of the lung by a large tumor mass, or by anemia. Fever and malaise are frequently seen secondary to infection. Paresthesia, weakness, or muscle paralysis denote spinal cord compression or intercostal involvement. Horner's syndrome shows involvement of the sympathetic trunk and is usually seen in tumors high in the chest or neck involving the stellate ganglion. Voice change denotes involvement of the recurrent laryngeal nerve. Palpitation is usually associated with mediastinal shift causing heart displacement. Dysphagia denotes compression or involvement of the esophagus. Occasionally an anterior mediastinal tumor will cause venus blockage with edema of the face and neck. Other tumors have been found to obstruct venus return from the lower part of the body, with resulting edema and ascites. Neurogenic tumors often cause pain because of their involvement of nerve trunks or pressure on the spinal cord. Severe anemia or weight loss is suggestive of a malignancy.

Physical findings are often absent. Large tumors may produce definite changes in the function of the chest. In late malignancies a liver nodule may be palpated. Changes in reflexes, sensation, and motor function may occur with brain or spinal cord involvement.

Laboratory data is often of no diagnostic value. Severe anemia suggests malignancy or bleeding. Certain blood studies, comple-

ment fixation tests, and intradermal tests are indicated to rule out specific diseases.

SYMPTOMS

I. *Infection.*
- A. Adjacent to the tumor.
  - a. Pneumonitis.
  - b. Bronchial block.
    1. Cough (productive).
    2. Dyspnea.
    3. Fever.
    4. Malaise.
- B. Of the tumor.
  - a. Encapsulated fluid.
  - b. Empyema.
  - c. Abscess.
  - d. Bronchopleural fistula.

II. *Pressure.*
- A. On mediastinal structures.
  - a. Trachea.
    1. Cough.
    2. Dyspnea.
  - b. Esophagus.
    1. Pain (substernal).
    2. Dysphagia.
  - c. Mediastinal shift (heart).
    1. Pain.
    2. Tachycardia & palpitation.
    3. Dysphagia.
  - d. Veins.
    1. Edema.
    2. Ascites.
    3. Cyanosis.
  - e. Sympathetic trunk.
    1. Pain.
    2. Horner's Syndrome.
    3. Sympathetic stimulation.
  - f. Parasympathetic trunk.
    1. Cough.
    2. Voice change.
    3. Pain in the ear.
- B. On other structures.
  - a. Intercostal nerve or spinal cord.
    1. Pain.
    2. Paresthesia.
    3. Weakness.
    4. Paralysis.

A. *Cough.*
1) Pneumonitis.
2) Bronchial block.
3) Bronchopleural fistula.
4) Tracheal compression or deviation.
5) Parasympathetic stimulation.

B. *Pain.*
1) Parietal or mediastinal.
2) Intercostal nerve involvement.
3) Spinal cord compression.
4) Mediastinal shift.
5) Involvement of sympathetic trunk.

C. *Dyspnea.*
1) Toxemia.
2) Fluid with lung compression.
3) Atelectasis.
4) Tracheal compression or deviation.

D. *Fever and malaise.*
1) Pneumonitis.
2) Empyema.
3) Abscess.
4) Bronchopleural fistula.

E. *Weakness and paresthesia or paralysis.*
1) Nerve compression.
2) Spinal cord involvement.

## Diagnosis

I. *X-ray and fluoroscopy.*
   A. Size, shape and position of tumor.
   B. Presence of fluid.
   C. Presence of mediastinal shift.
   D. Deviation or compression of trachea.
   E. Presence of bronchial block, atelectasis or emphysema.
   F. Relationship to surrounding structures.
   G. Barium swallow to show relationship to, or involvement of esophagus.
   H. Lipiodolization to show position of bronchial tree.
   I. Bone erosion.
   J. Position and function of diaphragm.
   K. Pulsation of tumor.
   L. Angrocardiography.
   M. Calcifications in the tumor.

II. *Bronchoscopy.*
   A. Position of bronchial tree.
   B. Presence of tumor.
   B. Presence of tumor.
   C. Paralysis of vocal cords.

III. *Pneumothorax.*

IV. *Thoracoscopy.*

V. *Aspiration of fluid.*
   A. Presence of blood.
   B. Presence of tumor cells.
   C. Character of fluid.

VI. *Laminography.*

VII. *Needle biopsy.*

VIII. *Hormone Assay.*

X-ray and fluoroscopic examinations are the most important diagnostic procedures. The size, shape and position of the tumor can be noted. Lobulation of the tumor, particularly in cases of neurogenic tumors, is a most reliable criteria of malignancy. The presence of fluid may be due to infection or neoplastic change. Deviation or compression of the trachea, due either to the tumor mass, or mediastinal shift, may often be noted. If atelectasis or emphysema are present, one must search for an endobronchial extension. If a severe amount of mediastinal shift is noted, heart palpitation, substernal pain, and, occasionally, dysphagia will result. Barium swallow is particularly valuable in posterior mediastinal tumors and should be carried out to show the relationship of the esophagus to the tumor mass.

The introduction of lipiodol is rarely of great value but will sometimes show a communication of the tumor with the bronchial tree

or the presence of a bronchopleural fistula. Bone erosion should be suspected, particularly in pulsating tumors or in tumors of the posterior mediastinum. Enlargement of the intervertebral foramen will occasionally give a clue that a mediastinal mass has extended into the vertebral foramen. Fluoroscopy will often show pulsation of the tumor mass which may be expansible or transmitted in type. Fluoroscopy will show the position and function of the diaphragm and is often an important factor in questionable malignant tumors. Tumors that are suspected of being aneurysms are best diagnosed by the introduction of 70 per cent diodrast and study by fluoroscopy and x-ray. Calcium deposits are sometimes of great diagnostic help. They may be seen, however, in the teratomas, thyroid tissue, bronchogenic cysts, thymic tumors, neurofibromas, and aneurysms.

Bronchoscopy should be used to note vocal cord paralysis and to substantiate the position of the bronchial tree. If an endobronchial tumor or a bronchopleura fistula is suspected, bronchoscopy is quite important. Esophagoscopy should be done in all cases showing a remote sign of having a primary esophageal tumor. Pneumothorax is used to show the presence of a tumor mass in the lung that might be suspected of being extrapulmonary. Thoracoscopy may follow pneumothorax if one feels that a biopsy can be obtained in this manner.

Aspiration of pleural effusion should be done to show the character of the fluid present, to rule out the presence of red blood cells, and to examine the fluid for tumor cells. Bloody fluid most frequently denotes malignancy, but this is not always true. If the fluid is pus, empyema with or without bronchopleural fistula is present.

Laminography is rarely helpful but hormone assay is sometimes of value in the diagnosing of malignant teratomas. Needle biopsy may be helpful in peripheral lesions or in questionable lesions arising from the chest wall.

The treatment of choice in these cases is surgical removal. Surgical biopsy is indicated when necessary to make a prompt, accurate diagnosis.

In summary, I would like to bring out these points:

1. All primary mediastinal tumors should be removed immediately upon being discovered. Delay may be disastrous.

2. Mediastinal tumors of uncertain diagnosis deserve prompt exploration in order to afford an early, accurate diagnosis and adequate, proper treatment.

3. Because of the high incidence of malignancy in mediastinal tumors, surgical intervention is often the only way to offer an accurate diagnosis and a true prognosis to the patient.

4. Since many mediastinal tumors are asymptomatic and because asymptomatic tumors show a low incidence of malignancy, routine x-ray examinations of the chest should be carried out on all patients.

5. Early diagnosis and surgical removal is the only way to reduce the incidence of malignancy and the ultimate mortality in primary mediastinal tumors.

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# INDUCTION OF LABOR BY A DILUTE PITOCIN INFUSION

## A Trial Simulating Home Conditions

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THERE is a need for a safer technic of administration of posterior pituitary solution in the first and second stages of labor than the methods now widely used in rural practice. The indiscriminate use of pituitary in doses of cubic centimeters is frequent. The patients on whom pituitary is used in such a fashion are often unselected as to the condition of the cervix, presentation, cephalopelvic disproportion or toxemia of pregnancy. The authors learned this in their experience in a rural state, one as an obstetric consultant to the State Board of Health, and the other as an obstetric-gynecologist resident in a small charity hospital in the same state. The aggregated experience with this type of maternity care amounted to thirty months of work and the discussion of maternity problems with some two hundred practitioners.

The prime reason pituitary is used is convenience. The rural practitioner, harassed by overwork, too many patients, poor secondary roads, inadequate hospital facilities and nursing shortages, gives pituitary to patients to shorten the amount of time spent on each case. A recent statement[1] by a Professional Lecturer in Rural Medicine and General Practice named "the lack of time of the physicians" . . . a major cause of "the criticism of obstetrics as it is done in rural areas. . . ." He commented on "too large and unjustified doses of pituitrin" and "the desire to get through and get back home leads to too much pitocin. . . ." The unwise use of this drug in urban practice is far from unknown.

Intranasal application of pituitary, thymophysin, pit-sulfonate and pituitary in oil represent attempts to modify the dangers of this hormone from the posterior pituitary gland. None today has gained wide usage.

The slow, cautious use of intramuscular injections of pituitary solution, such as practiced on the Tulane Service of the Charity Hospital of Louisiana and other teaching institutions, is probably the safest method of utilizing that drug yet described for inducing or hastening labor. The general scheme includes an initial injection

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of only one-half minim followed by doses increasing one-half minim each time at thirty minute intervals. Not more than either 2 or 3 minims are given at any one injection and a total of 1.0 c.c. never exceeded. When regular contractions are established the schedule is interrupted. Each contraction should have its duration recorded as well as the length of time intervening between contractions. A tetanic response calls for halting of the treatment and possibly ether inhalation anesthesia. The blood pressure and fetal heart tones are closely observed. Even with this wary approach, tetanic uterine contractions with fetal embarrassment and even uterine rupture have been reported. The demand on the time of the physician makes the wide application of this plan unthinkable today in many practices.

Recently there have been brought forward two promising accounts of the use of very dilute infusions of post-pituitary extract.[2,3] The present authors thought that this technique could be adapted to home use and have tried it under conditions simulating those found in the home. The patients selected for this trial were the type of patients the authors knew were often the target for one or more ampules of pituitary.

## Technic

Pitocin, usually 4 minims, was injected into a 1000 c.c. flask of fluid intended for intravenous use. Six or 8 minims have also been added to the flask, particularly in cases that failed to respond to weaker solutions. At first, 10 per cent dextrose in distilled water was selected but later the less irritating 5 per cent dextrose seemed safer for the relatively unsupervised venoclysis. The flask was suspended 3½ to 4 feet above the bed and the infusion started with a 22 gauge needle in a vein at the elbow. A clamp was placed on the rubber tubing but not tightened, the solution being allowed to run in as rapidly as it pleased. At the outset a student nurse was instructed to discontinue the infusion when contractions seemed established at five to 10 minute intervals or closer. Appropriate warning was issued concerning tetanic contractions. After the authors had familiarized themselves with the possibilities of this treatment, conditions in the home were approximated by instructing the patient and a non-medical attendant how and when to stop the drip. The attendant was either an ambulatory patient or a visiting relative.

This clinical exploration was carried out at a hospital well suited for it, the South Mississippi Charity Hospital at Laurel. The medical personnel of this general hospital consisted of a doctor-superintendent, a general resident and the obstetric-gynecologic resident.

The usual daily census was 55-70 and the monthly birth rate about 50. Most of the maternity patients had prenatal care at clinics conducted by the county units of the Mississippi State Board of Health in this hospital and in the surrounding counties; the obstetric resident assisted at these clinics. A number of the patients were referred to the hospital by local practitioners. Elective outlet or low forceps and episiotomy were the routine on the service unless the resident was otherwise engaged. Low spinal, local or no anesthetic were generally used.

A point the authors thought not sufficiently emphasized elsewhere was the importance of a "ripe" cervix, the cervix that is ready to dilate, in the successful use of pituitary, or indeed in any induction of labor. Therefore it was planned that the patients to be treated all have ripe cervices, a fact deserving credit for successes in this clinical trial. The "ripe" cervix may be defined as one that is soft, succulent, or nonrigid. In the primipara it is completely effaced and is at least one finger dilated or offers no resistance to the introduction of a finger. In the multipara at least approximately 1.5-2.0 cm. dilitation is present; effacement is not as important as in the primipara but a reduction in the length, or thickness, of the cervix and inability to palpate the internal os are signs of ripeness.

The patients were usually admitted to the hospital because of labor that later proved to be false. Seven patients (Nos. 3, 5, 13, 20, 23, 24, 25) were experiencing an inordinately long prodromal stage, evidenced by irregular and very mild contractions at intervals of 20 to 60 minutes. These contractions were painful to the patient but ineffectual and did not dilate the cervix or produce progression of effacement. These cases were considered not to be in labor. The numbers of hours they were under observation before induction were 6, 24, 6, 24, 6, 20 and 23 hours, respectively. Induction of labor was attempted because of (1) improbability of the patient getitng back to the hospital in time for delivery if discharged because of distance or handicaps of transportation, (2) suitability of the patient for this clinical investigation.

All of the patients were at term as estimated by the height of the fundus; these observations were later substantiated by the weights of the infants. The past obstetrical histories did not seem to contraindicate the proposed treatment. A physical examination and the routine blood and urine studies were done. The patients were prepared and given an enema on admission and as the induction was usually started a number of hours later the stimulus of this procedure was minimized. A careful vaginal examination was done to determine the condition of the cervix, position, presentation, sta-

tion, internal pelvic measurements and absence of cephalopelvic disproportion. Disproportion seemed out of the question in each case. While examining the cervix, great care was exercised not to digitally dilate it or strip the membranes, providing as far as possible a clear evaluation of the method of induction under study. Fifteen to 20 cases were rejected for induction because the cervix was not ripe; these cases were discharged from the hospital and delivered days or weeks later.

During the induction the blood pressure and fetal heart tones were recorded frequently. The duration and intensity of the uterine contractions were observed several times in each case, particularly early in the infusion.

The cases reported here are the authors' entire experience with pitocin drip induction. No cases are excluded.

## Results

The results of the induction are summarized in Table I.

TABLE I

| No. | Parity | Cervix | Amt. Pit. | Duration Infusion | Length Labor | Outcome |
|---|---|---|---|---|---|---|
| 1. | 0 | Ripe | 4m/ | 4 hrs. | 0 | Failure<br>Delivered at home 5 days later. |
| 2. | 3 | Ripe | 4m/<br>4m/<br>3½m/ | 5½ hrs.<br>4¾ hrs.<br>2 hrs. | 0<br>0<br>3½ hrs. | No contractions<br>No contractions<br>Successful, N.S.D. |
| 3. | 1 | Ripe | 1m/ | 40 min. | 5 hrs. | Successful<br>Assisted breech. |
| 4. | 4 | Ripe | 1m/ | 55 min. | 4½ hrs. | Successful, N.S.D. |
| 5. | 0 | Ripe | 1m/ | 40 min. | 20 hrs. | Successful<br>Elective outlet forceps. |
| 6. | 6 | Questionably Ripe. Admitted one finger, 1 cm. thick, Posterior lip, fibrous feel on its inner aspect possibly due to scar tissue. | 1m/ | 45 min. | 9½ hrs. | Successful<br>Elective low forceps |

TABLE 1 (*Continued*)

| No. | Parity | Cervix | Amt. Pit. | Duration Infusion | Length labor | Outcome |
|---|---|---|---|---|---|---|
| 7. | 4 | QUESTIONABLY RIPE. Soft but with slight suggestion of resistance. 1.5 cm. dilated and 1.5-2.0 cm. long. | 4m/ | 5 hrs. | False labor | |
| | | No change | ½m/ | 40 min. | False labor | FAILURE Delivered at home 3 days later. |
| 8. | 5 | RIPE | ½m/ | 30 min. | 5¾ hrs. | SUCCESSFUL, N.S.D. |
| 9. | 2 | QUESTIONABLY RIPE. 1.5 cm. long 1.5 cm. dilated. In general soft but had few small fibrous feeling areas. | 1m/ | 90 min. | False labor | |
| | | No change | 4m/ | 4 hrs. | 0 | |
| | | RIPE. (18 days later.) No fibrous areas. 2.0 cm. dilated. 1.5 cm. long. | 2m/ | 2 hrs. | 55 min. | SUCCESSFUL, N.S.D. |
| 10. | 5 | RIPE | 4m/ | 6 hrs. | 11½ hrs. | SUCCESSFUL, N.S.D. |
| 11. | 1 | RIPE | ½m/ | 1½ hrs. | 6½ hrs. | SUCCESSFUL Low forceps. |
| 12. | 7 | RIPE | 3½m/ | 3½ hrs. | 11 hrs. | SUCCESSFUL, N.S.D. |
| 13. | 2 | QUESTIONABLY RIPE. 1.5 cm. dilated, 2.5 cm. long. Soft but a semi-hard ring felt at inner end of canal. | 6m/ | 4 hrs. | 0 | FAILED, N.S.D. 21 days later. |
| 14. | 1 | RIPE | ½m/ | 15 min. | 7 hrs. | SUCCESSFUL, N.S.D. |
| 15. | 4 | RIPE | 2m/ | 1½ hrs. | 1½ hrs. | SUCCESSFUL, N.S.D. |
| 16. | 5 | QUESTIONABLY RIPE. 1.5 cm. long. 2 cm. dilated. Small resistant area in posterior lip. | 4m/ | 5½ hrs. | 0 | |
| | | Same next day | 6m/ | 7½ hrs. | 0 | |
| | | Same next day | 8m/ | 5¾ hrs. | 0 | FAILED Precipitated at home 10 days later. |

TABLE 1 (*Continued*)

| No. | Parity | Cervix | Amt. Pit. | Duration Infusion | Length Labor | Outcome |
|---|---|---|---|---|---|---|
| 17. | 6 | RIPE | 3m/ | 4 hrs. | 3½ hrs. | SUCCESSFUL, N.S.D. |
| 18. | 1 | RIPE | 1m/ | 1 hr. | False Labor | |
| | | No change next day. | 1m/ | 1¼ hrs. | False labor | FAILED, N.S.D. 16 days later. |
| 19. | 3 | RIPE | 1m/ | 1½ hrs. | 30 hrs. | SUCCESSFUL, N.S.D. |
| 20. | 5 | RIPE | ½m/ | 1¼ hrs. | 2¾ hrs. | SUCCESSFUL, N.S.D. |
| 21. | 0 | RIPE | 2m/ | 1½ hrs. | 3 hrs. | SUCCESSFUL Elective forceps. |
| 22. | 2 | RIPE | 2m/ | 1¾ hrs. | 1¾ hrs. | SUCCESSFUL, N.S.D. |
| 23. | 3 | RIPE | 3m/ | 3¾ hrs. | 6½ hrs. | SUCCESSFUL, N.S.D. |
| 24. | 0 | RIPE | 1m/ | 1¾ hrs. | 7¼ hrs. | SUCCESSFUL Elective outlet forceps |
| 25. | 1 | RIPE | 2m/ | 2½ hrs. | False labor | |
| | | No change 2 days later. | 6m/ | 2½ hrs. | False labor | FAILED Precipitated 2 days later. |
| 26. | 2 | RIPE | ½m/ | 1 hr. | False labor | |
| | | No change 2 days later. | 2m/ | 3½ hrs. | 2½ hrs. | SUCCESSFUL, N.S.D. |
| 27. | 8 | NOT RIPE* Not effaced. Admitted finger. Internal os palpated. | 1½m/ | 2½ hrs. | 0 | FAILED Delivered at home 35 days later. |
| 28. | 2 | QUESTIONABLY RIPE. 1.5 cm. dilated. Anterior lip 1 cm. long and very soft. Posterior lip 1.5-2 cm. long with hard rim at its internal portion. | 4m/ | 3½ hrs. | False labor | FAILED Delivered 21 days later. |

*Induction attempted by error.

In the 22 trials with ripe cervix, induction was considered successful in 19 cases. In the 6 cases in which the cervix was questionably ripe, induction was successful in only one case. Induction failed in the one case in which the cervix was not ripe. The 2 cases (2 and 3), that required more than one infusion to produce labor were considered successful. Two of the 7 patients described as having a lengthy prodromal stage failed to go into labor.

At the beginning of the infusion no patient had a dilatation greater than 2.0 cm.

Four of the cases were primiparas and there was one failure among them. The cervix was considered ripe with complete effacement in each primipara.

The patients, assisted by husband, female relative or ambulatory patient, proved to be good judges of when to terminate the infusion. The drip was discontinued, and at times the needle withdrawn, without mishap.

The membranes were intact during the infusion in all cases except three: No. 9, nineteen hours ruptured at the time of the first infusion, forty hours at the second and nineteen days at the third; No. 15, membranes ruptured for fifteen hours; No. 17, twenty hours.

No head had descended farther than the spines at the initiation of the infusion. Seven were at station 0, one head was floating and the remainder scattered at intervening stations. In this series there was no correlation between the station and success of the induction.

There was no fetal, neonatal or maternal mortality. All cases were examined immediately after delivery for cervical and vaginal lacerations. Only one patient had a laceration that indicated a suture. All infants cried immediately on birth, for which choice of anesthesia and sparse use of narcotics deserve credit. One patient (12) two hours after delivery had some uterine relaxation which was readily controlled. In each case the third stage of labor was normal.

Calculating as accurately as possible the length of labor in the cases successfully induced, the cases fell into the following groups:

Labor less than five hours = 9 cases
Five to 10 hours = 7
More than 10 hours = 4

There was no evidence of fetal distress or tetanic contractions in any case. The infusions may have effected a minor elevation in the blood pressure in three cases but a case of hypertensive disease who

received the infusion by mistake did not have her pressure adversely altered.

The urinary output was not accurately measured in any case but no gross reduction was recognized.

The patients' ages ranged from 16 to 43 with a median of 25. Nineteen were white and 9 colored.

## Comment

Use of the 22 gauge needle and the dispensing of the clamping of the infusion tubing seem important because they bring a good deal of simplicity to the procedure. Although the amount of time required to empty a 1000 c.c. flask under these conditions varies widely, the range of infusion rates seems safe. The patient whose 1000 c.c. infusion was completed in the shortest time revealed pitocin at the rate of 1 minim in forty minutes. The longest infusion required six hours. The need of counting the drops and adjusting the clamp on the tubing is eliminated.

Although there were no tetanic contractions observed in this series, the possibility of a uterus being sensitive to pitocin even in very dilute solution must be borne in mind. Added danger of uterine rupture probably exists in women of greater multiparity or where the membranes have been ruptured a long time.

The success that met the cases with ripe cervix, when compared with the outcome in the questionably ripe and the unripe, illustrate the all-importance of the condition of the cervix in predicting the outcome of an induction.

It will be noted how often the amount of pitocin necessary to start labor was small (½-1m/). This correlates well with the experience of others in that when a uterus is ready to go into the effective contractions of labor only a small amount of stimulation is needed and cases that will not respond to small doses are not usually going to react to large doses. A related and interesting point is the intervals between our failed inductions and the eventual birth, following spontaneous labor. The periods of time were 5, 3, 21, 10, 16, 2, 35 and 21 days. At the before-mentioned hospital, patients have been received who have had 2 to 3 c.c. of pituitary elsewhere without labor ensuing. These cases had unripe cervices.

These patients were carefully selected cases that were not in labor, making all of these infusions attempts at induction of labor. The method undoubtedly has possibilities in augmenting labor already established but poor in quality.

The authors recognize that these infusions of pitocin are not

without danger. Exhortations in medical meetings, journals and schools, pleading for the abandonment of recklessly blasting babies into the world with unphysiological doses of posterior pituitary solutions have evidently been received as impractical by many. Dilute infusions of pitocin may be a more realistic approach and should be investigated further. If this technic proves safe and fairly effective after more comprehensive study, stimulation of its use, and consequent less thinking in terms of ampules of pituitary, might result from the commercial preparation of infusion sets of the dilute solution.

## Summary

Induction of labor by very dilute infusion of pitocin was attempted in 28 cases. The procedure was successful in 19 of the 22 cases that had ripe cervices. The importance of the ripe cervix and proper selection of cases for induction were emphasized. A simple and apparently safe technic for induction of labor with possibilities for home use was offered for further investigation.

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# SURGICAL MANAGEMENT OF RECTAL PROCIDENTIA*

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PROCIDENTIA of the rectum even today serves as a problem, evidence of which are the more than three score procedures devised for its correction. Although the entity has been attacked rationally from an anatomic basis, the results achieved, both immediate and particularly remote, have been far from satisfactory. In this discussion our remarks will be confined to procidentia, otherwise designated pelvic procidentia or intussusception, in which the lower sigmoid colon, rectosigmoid and rectum, with all its coats, including the peritoneal layer, is invaginated or telescoped into the rectum and even through the anal aperture.

It is generally recognized that for procidentia to occur, the normal supportive structures must be congenitally absent or defective, or have undergone some change such as weakening, dislodgment or destruction. In children, especially between the ages of 1 and 5, procidentia is not a rarity. To a great measure this is due to the immature development of contiguous structures. Other factors to be mentioned are, the absence of the sacral curve, the high position of the bladder and uterus, and the almost vertical position of the rectum. In adults, weakness of the pelvic musculature, an elongated mesocolon, and an abnormally low-lying cul-de-sac of Douglas are regarded as important predisposing causes. Invagination of this pouch through its posterior wall and into the rectum is considered by many as analogous to a hernia of the sliding type.[1,3,4,5,6] Debilitating diseases and nutritional disturbances which give rise to absorption of the ischiorectal fat should be cited. In advanced years, because of general debility with impaired circulation, emaciation and lack of muscle tone, procidentia is not uncommon. Interference with the neural mechanism, as in tabes dorsalis, or in fact any condition or disease which produces paralysis or relaxation of the sphincter and levator ani muscles, is conducive to procidentia. Undoubtedly straining at stool is an important etiologic factor and is usually concomitant with, or the result of, a protracted diarrheaic condition or an obstinate constipation. We share the view that such is superimposed on an existing process as previously mentioned.

Intrinsic causes refer to those within the lumen of the bowel

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which drag down its lining. Those of extrinsic origin may be parturition, tumors and displacements of the uterus, hypertrophy and tumors of the prostate, visceroptosis, drastic purgation, and intra-abdominal growths. Traumatic causes which bear influence are injuries to the sphincter muscle, laceration of the perineum and foreign bodies. Under increased intra-abdominal pressure, are those which either physiologically or pathologically provoke straining, such as obstipation, vomiting, coughing, crying, violent exercise, corsets and belts tightly applied, and those induced by urethral calculus stricture and phimosis. Inflammatory processes—proctitis of various types, intestinal parasites, and especially ascarides—that tend toward structural weakness of the individual layers of the rectum, should be cited.

Fig. 1. Uterus elevated; bowel drawn taut and incision of peritoneum on the left side with exposure of tendon of psoas minor.

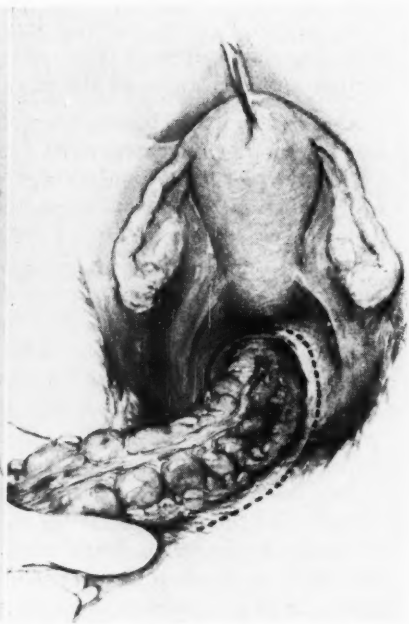

Fig. 2. The incision is carried in the right side in the same manner to meet fellow of opposite side.

Protrusion of all the coats of the rectum into its lumen may be noted by the increase in thickness and firm consistency of the mucosa. In sigmoidal procidentia, all the coats of the sigmoid descend, including the peritoneal layer.[7] As evident through the anal orifice, a series of circumferential folds irregularly placed are diagnostic.

The protruding mass is oval in shape, thick and firm to the touch. As much as 17 inches may extend beyond the anal aperture,[8] but protrusion of more than 2 or 2½ inches usually contains the peritoneal layer.[9]

Fig. 3. Rectosigmoid and rectum mobilized anteriorly and posteriorly, thus rendering prominent the lateral ligaments. Suture of the lateral ligaments to Denonvillier's fascia in the male and to endopelvic fascia in the female.

Fig. 4. Bowel is held taut while interrupted sutures are introduced between longitudinal band and tendon of psoas minor.

Van Buren,[10] in 1881, advocated linear cauterization, a maneuver that is seldom found applicable except for infants. Smith[11] employed excision by the clamp and suture in various quadrants. A popular approach is the Delorme[13] method, and the David modification,[14] which consists of denuding the mucosa covering the protruding mass followed by transverse plaiting by axial suture. Hayden,[15] particularly, is enthusiastic with the results obtained.

Based on the original procedure published by Duval and Lenormant, in 1904,[16] Lynch[17,18] described a method to shorten the lateral ligaments. In the male the operation is performed through the abdomen, while in the female the ligaments are approached through the vagina. Lange[19] narrowed the rectal lumen by plicating and plaiting the posterior and posterolateral aspects of the rectum. A

not dissimilar method combining shortening by transverse plication and fixation was devised by Verneuil.[20] Both Gant[21] and Tuttle[22] offered modifications.

Fig. 5. Incised peritoneum is sutured with fine catgut.

Based on the original investigation of Jeannel,[23] the modification of Pachino[24] and those later by Quenu and Duval,[25] E. G. Martin[26] employs a procedure in which the bowel is fixed by suture to the tendinous portion of the psoas minor muscle. Pertinent to sigmoidopexy in general, Pachino[24] reported a series of 58 cases with one death and 13 recurrences. Hartmann[27] cites a group of 22 cases without a single death but with 12 recurrences, while Carrasco[28] describes 6 cases without recurrence.

Consistent with the generally accepted theory that rectal procidentia is analogous to a hernia of the sliding type, Samter,[29] Quenu and Duval,[25] and Moschcowitz[4] developed a procedure that has proved of definite value. The late Roscoe Graham[1,2] concurred with the views of Jeannel[23] and Moschcowitz as to etiology, but believed that adequate repair could be accomplished only by employing the same principles applied to all hernias, especially that of the sliding type. In order to remove the peritoneal sac and

restore the anatomic defect in the pelvic fascia, he forced the rectum into the sacral hollow by approximating the fascia covering the levators. Pemberton and Stalker,[30] following mobilization, fix the sigmoid to the lateral abdominal wall by suture. For severe cases accompanied by perineal herniation, C. W. Mayo[31] achieves fixation by imbricating the peritoneum over strips of fascia lata. Quite recently Orr[32] designed another method of repair in which strips of fascia lata are sutured to each side of the rectum, and above to the dense fascia of the sacral promontory.

A method originally designed for sigmoidal cancer that presents merit in selected cases of massive procidentia, provided the sigmoid is markedly elongated, is the Bloch[33]-Mikulicz[34] exteriorization procedure with resection. Here the bowel is shortened, fixed to the anterior abdominal wall, the redundant sigmoid excised, with later extraperitoneal closure. Ault,[35] and others,[15,36,37] have employed this method with satisfaction. In an unusual instance, Hunt[46] found the abdominoperineal method of excision of value.

Originally performed by Auffret,[38] in 1882, and employed by others early in the twentieth century,[39,11] Miles[40] described an amputative type of operation under the title "rectosigmoidectomy." It is similar to the technic of proctosigmoidectomy previously devised by Babcock,[45] with the exception that in the former a complete peritoneal diaphragm is established.

RECTOSIGMOIDECTOMY (MILES)

| *Author* | *No. Cases* | *Deaths* | *Recurrences* |
|---|---|---|---|
| Miles[40] | 31 | 1 | 1 |
| Gabriel[41] | 40 | 2 | 6 |
| Abel[42] | 3 | 1 | ? |
| Sheldon[43] | 5 | 0 | 0 |
| Yeomans[44] | 3 | 1 | 0 |
| | 82 | 5 | 7 |

An approach which we feel is well suited in the majority of instances consists of fixation of the sigmoid to the psoas fascia, shortening of the lateral ligaments by approximation, suspension of the uterus (Gilliam, Webster), and finally obliteration of the cul-de-sac.

*Technic:* The abdomen is opened through a midline incision and the patient placed in an exaggerated Trendelenburg position. After the pelvis is cleared of small bowel which is packed off, the degree of redundancy and mobility of the sigmoid and rectosigmoid is begun by an incision in the lateral gutter close to the bowel which

is carried to the rectouterine or rectovesicle sulcus. In the course of this dissection, the left ureter is identified and retracted; the

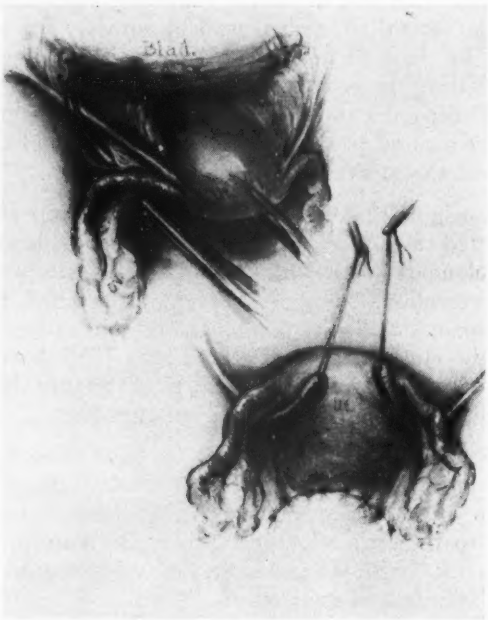

Fig. 6. Steps in uterine suspension. Round ligaments on each side is drawn through slit in broad ligament and elevated. Cul-de-sac is obliterated by the introduction of a series of fine silk sutures interruptedly placed.

tendinous portion of psoas minor muscle (lying in front of the psoas major), or the iliac fascia being exposed for future fixation. The right peritoneal leaf is incised close to the bowel and carried to meet the incision from the opposite side. Mobilization is further effected anteriorly and posteriorly while the lateral ligamentous attachments are rendered prominent. Two or three plicating sutures are introduced, figure of eight fashion, between each lateral ligament and the upper fibrous attachment of Denonvilliers' aponeurosis or the endopelvic fascia in this locality. The sigmoid is lifted out of the pelvis and drawn taut. Thereafter, 3 or 4 #0 silk sutures are introduced between the longitudinal band of the sigmoid and the exposed tendon of the psoas minor muscle. Each is placed one-half centimeter apart and left untied until all have been inserted. Thus, fixation is effected by tying all sutures. The incised peritoneum is stitched together with fine catgut.

In the female a modified type of Gilliam uterine suspension is performed. Here, the broad ligament on each side is slit close to

the body of the uterus, and the round ligament grasped with hemo-

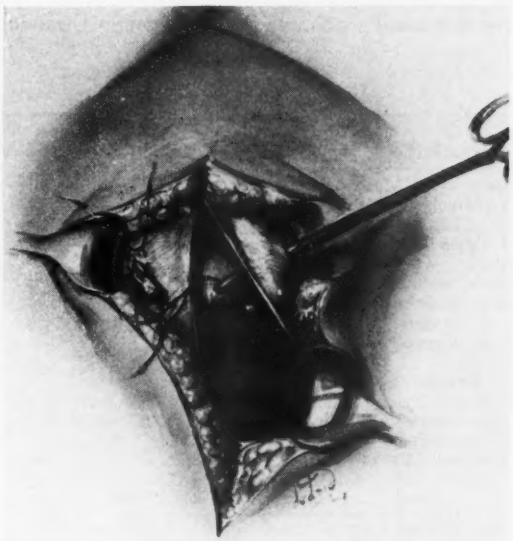

Fig. 7. Fixation of round ligament to anterior abdominal wall. The skin and fat have been retraced to expose the aponeurosis. A stab wound is made through the aponeurosis and the peritoneum on each side. On right: temporary ligature about round ligament is grasped by hemostat. On left: round ligament has been drawn through stab wound and sutured with alloy steel wire. (Finally, abdomen is closed, using figure-of-eight alloy steel wire.)

stats one and one-half inch from the uterus and drawn through. A temporary ligature is placed around the round ligament and caught with forceps. One inch above the pubic spine the skin and fat are retracted and the aponeurosis rendered bare on each side. A stab wound is made one-half inch in length through the aponeurosis, muscle and peritoneum, one inch from the margin of the incision. Through the stab wound a hemostat is introduced and the temporary ligature around the round ligament grasped and withdrawn. The final step consists of obliterating the cul-de-sac by introducing a series of #0 silk sutures, beginning one-half inch above the apex of the newly formed pouch. The abdominal wound is closed, employing figure of eight sutures of alloy steel wire. The transplanted round ligament is sutured to the superior surface of the aponeurosis with #32 alloy steel wire. In the fixation of the round ligament to the abdominal wall, care should be instituted to include only one-half its thickness in order to avoid interference with its blood supply. The round ligament on the opposite side is brought through and sutured in a similar fashion.

During the nine year period ending September, 1950, forty-two patients with procidentia have been operated upon. The technic employed and the results achieved are shown in the accompanying chart.

OPERATIVE TECHNIC

| *Abdominal Approach* | *No. Cases* | *Operative Deaths* | *Recurrence* |
|---|---|---|---|
| Fixation to psoas muscle (Martin); obliteration of peritoneal pouch (Moschcowitz) with or without uterine suspension | 20 | 0 | 3 |
| Shorten lateral ligaments (Lynch); fixation to psoas muscle (Martin) | 6 | 0 | 0 |
| Intersigmoidal fossa obliteration (Hirschman); fixation to psoas muscle (Martin) | 3 | 0 | 1 |
| Approximation of levators (Graham) | 1 | 0 | 0 |
| Exteriorization of sigmoid and anastomosis (Bloch-Mikulicz) | 3 | 0 | 0 |
| Mobilization and fixation to pelvic brim (Pemberton) | 1 | 0 | 0 |
| *Perineal Approach* | | | |
| Resection and anastomosis (Mikulicz) | 4 | 2 | 0 |
| Perineal proctosigmoidectomy (Babcock) | 1 | 0 | 0 |
| Avulsion and plication (David-Rehn-Delorme) | 3 | 0 | 0 |
| Total | 42 | 2 | 4 |

## CONCLUSION

The experience gained has convinced the writers that true prolapse, or procidentia, is best attacked by an abdominal approach. Further, that each case must of necessity be individualized according to the findings upon exploration. In combination, a surgical procedure is presented for which no originality is claimed.

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## THE OPERATIVE RISK IN THE ELDERLY PATIENT

There has been a 35 per cent increase in the population over 55 years of age during the decade of 1930 to 1940. Since more people reach this age, there naturally occurs a larger group which will require surgery under varying conditions. It has long been known that there is a greater danger of operation past 50 years than in the younger age group. Sohlberg states that the risk is eight times that in a younger person.

With the advent of better preoperative preparation, newer antibiotics, and improved anesthesia, this risk has been materially minimized. Before undertaking surgery in the aged, it is well to estimate the exact age. It must be realized that the patient cannot be measured by his chronological age but must be measured by his physiologic status. Many individuals at 50 years may be much older than others at 70 years. Knowledge of the dietary habits, vitamin deficiencies, and state of nutrition is most important. Definite physiologic disturbances occur with age which must be considered, as well as changes which occur with the disease.

One of the difficulties in maintaining normal nutrition in the

elderly patient is the inability to obtain an adequate protein intake. The protein needs in the elderly patient are for the most part greater than those in the younger individuals. This may be attributed to faulty habits, failure of absorption, and, above all, excessive excretion in the feces. It is essential, therefore, that in the preparation for operation a sufficient time is allowed so that a high protein, a moderate carbohydrate, a low fat, and a high vitamin diet may be administered.

Obviously, the cardiovascular system is of most importance and should be completely investigated. The cardiac reserve, the history of previous cardiac disease, and the degree of compensation, if such is present, are factors for consideration. This does not mean that patients who have had cardiac disease should not receive the benefits of surgery, but rather the problem primarily must be the measurement of the need of surgery against the actual risk involved.

Renal function should be known and an estimation of the blood constituents. The urinary concentration tests and tests for the specific gravity and output of the urine should be made. An attempt should be made to improve the urinary function in those instances in which time is available. Long-standing respiratory diseases, such as bronchiectasis, emphysema, and chronic cough add considerably to the risk to the patient. Measures for the improvement of these conditions, such as drainage and antibiotics, should be instituted.

The psychic factors involved in the elderly patient should not be minimized. A routine of life is established, the disturbance of which may determine the difference between success and failure. The least psychic trauma should be the ultimate aim in all instances. Many old patients have lost their desire to live and should be handled with patience, diligence, and skill during the hospital period.

The acute condition within the abdomen causes much difficulty in diagnosis. A frequent delay in seeking medical aid occurs as a result of fear, lack of consideration of the symptoms, and especially the desire to be of the least trouble to the family. A far too great a number of ruptured appendices occur in the elderly patient. The education of the family and attendants to elderly people should be directed towards an awareness of suspicious symptoms. It is realized that many of these patients have a multitude of complaints, but one should be particularly aware of appendicitis. Inadequate time is allowed for careful preoperative preparation due to the urgency of the condition. The problem of hydration is of more concern in the elderly group than others. Adequate intake and utilization of fluids is the key to most problems. Dangers of overhydration are equally emphasized since it does occur with too rapid admin-

istration, too great an amount of fluids, and, above all, the excessive administration of sodium.

The opiates or large doses of barbiturates must be utilized with considerable care, since the older patient responds much differently to doses which middle aged and younger people can tolerate. The maintenance of the normal blood volume by administration of blood cannot be too strongly urged. Extreme caution must be exercised in its administration because these patients can least stand the added risk of serious reactions. Every effort should be made to minimize such.

It is felt with all of the aids for handling the surgical patient that the indicated surgery should not be withheld from most patients on account of age. Many happy and useful lives can be completely rehabilitated by elective surgery and, above all, many lives can be saved when the condition is urgent.

J. D. MARTIN, JR., M.D.

# BOOK REVIEWS

*The Editors of* THE SOUTHERN SURGEON *will at all times welcome new books in the field of surgery and will acknowledge their receipt in these pages. The editors do not, however, agree to review all books that have been submitted without solicitation.*

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OPERATIVE OBSTETRICS, by J. M. MUNRS KERR, LL.D., F.R.C.O.G. (Hon. Causa) M.D., F.R.F.P.S.G., Professor (Emeritus), Reguia Chair of Midivifery, Glasgow University, and J. CHASSAR MOIR, M.A., M.D., F.R.C.S.E., F.R.C.O.G., Nuffield, Professor of Obstetrics and Gynecology, University of Oxford. The Williams and Wilkins Company Baltimore, 1950. Price, $12. 98 pages.

This book deals first and foremost with the diagnosis and treatment of the complications of labor. It is written primarily for obstetric specialists or prospective specialists, and for general practitioners who are seriously interested and actively engaged in obstetric practice.

It is well written on paper of good quality and has numerous illustrations which are all very clear.

The subject matter is presented very thoroughly and clearly by the authors. They begin by discussing the management of normal labor. They then present the problem of dystocia from faults in the forces; next, dystocia from faults in the fetus, then, dystocia from faults in the parturient canal. There is a section on obstetric operations and finally there are several chapters on injuries and accidents to mother and child.

R. M. SEALEY, M.D.

PYE'S SURGICAL HANDICRAFT, edited by HAMILTON BAILEY, F.R.C.S., Eng. 16th edition. Williams and Wilkins Company, Baltimore, Md., 1950. 724 pages, 30 illustrations.

This is the sixth edition of *Pye's Surgical Handicraft* that has been edited by Mr. Hamilton Bailey. During its revision Mr. Bailey became ill and had a rather long convalescence, and Mr. J. R. Elder helped immensely in the putting together of the volume. There are many new contributors, all of them specialists in their own branches, who have joined in the making of this volume.

The volume is rich in the "tricks of the trade." The majority of the procedures which are listed and described here are minor surgical procedures: These are the many procedures which are expected of house staffs in the various hospitals.

The book is directly and simply written, as are all of Mr. Hamilton Bailey's writings. The illustrations for the most part are quite good, being typically British. Many of the procedures which are used and many of the instruments which are shown are strange to America, yet very worthwhile.

This book should find its place in the library of all training hospitals and probably should be required on the bookshelf of all surgical interns.

A. H. LETTON, M.D.

CANCER OF THE COLON AND RECTUM (2nd edition), by FRED W. RANKIN, B.A., M.A., M.D., LL.D., S.C.V., F.A.C.S., and A. STEVENS GRAHAM, M.D., M.S. (in surgery), F.A.C.S. Charles C Thomas, Springfield, Ill., 1950. 439 pages, 237 illustrations. $7.50.

This is an excellent and complete text on colon and rectum surgery, which has been revised from the first edition which appeared in 1939. The book has been rewritten in many parts because of the better preparatory measures in the judicious use of chemotherapeutic agents and antibiotics at present and because of the changes in preoperative management with attention to protein and electrolyte balance. Immeasurable forward steps have been made in this field of surgery.

The edition is divided into three general parts, the first being headed, "General Considerations." This includes the anatomy, physiology and pathology of the area as well as the incidence of the disease, its symptoms and diagnoses. The second part which has been headed "Treatment" has been almost completely rewritten. It is here that the probability, resectability and prognosis are treated in much detail, as well as the reasons for the choice of operations being reviewed. Preoperative, postoperative treatment and the results are discussed. The third portion of the book is headed "Operative Procedures" and herein is a detailed description of the various procedures used in the treatment of each specific disease. The illustrations are well chosen and are for the most part pen and ink drawings. The descriptive word is quite plain.

This is a very worthwhile book, published on good paper with an excellent binding. The subject matter is well treated; the illustrations are excellent. In 1939 the Review Editor of THE SOUTHERN SURGEON remarked concerning the first edition that it contained "all the useful knowledge on this subject that the world has to offer today." It is our feeling that this all-inclusive statement may well hold true in the second edition of this excellent book.

A. H. LETTON, M.D.

# ABSTRACTS FROM CURRENT LITERATURE

DELAYED SUTURE IN THE MANAGEMENT OF WOUNDS. Analysis of 721 Traumatic Wounds Illustrating the Influence of Time Interval in Wound Repair. Kenneth F. Lowry and George M. Curtis. *American Journal of Surgery 80:*280-287 (Sept.) 1950.

The authors feel that in wounds, where surgical judgment has dictated that they be left open following primary debridement, the time interval between the initial wound surgery and the delayed closure is all important. From the analysis of 721 traumatic wounds in which delayed suture was utilized, it was learned that wounds left open longer than six days developed stiffening and fixation of the tissues with inversion of the skin margin and that such wounds required longer to heal and were more often subject to healing failures than wounds closed within the four to five day period. It was noted that the time interval also exerted a great effect upon the rate and time of eventual return to duty. The wounds studied in this group represented those incurred by 360 consecutive battle casualties and therefore were not selected but are representative of a fair cross section.

It was noted that wounds closed during the third day following initial surgery exhibited a healing rate of only 86 per cent which, when compared with the 97 per cent observed in the fourth and fifth day groups, is not too satisfactory. This follows the experimental work of Berman who found that localized immunity to infection is not present in wounds up to 24 hours old but in 48 hour old wounds 50 per cent immunity is present while in 72 hour old wounds 70 per cent immunity is demonstrable. In wounds beyond the 96 hour period 100 per cent immunity may be demonstrated.

Seventy-two per cent of those patients whose wounds were closed in six days or less were returned to duty in an average of 27 days as contrasted with 49 per cent returned to duty in an average of 32 days in the group with a time interval of seven days or more.

The authors feel that since healing approaching 100 per cent follows delayed closure at the optimal time, the principle may well be extended to apply beyond the realm of traumatic surgery.

R. H. S.

CONGESTIVE ATELECTASIS—A COMPLICATION OF THE INTRAVENOUS INFUSION OF FLUIDS. M. T. Jenkins, R. F. Jones, Ben Wilson, and C. A. Moyer. *Annals of Surgery 132:*327-347 (Sept.) 1950.

By way of definition the authors quote Fegler and Banister's description of the gross and microscopic appearance of the lung attendant to this phenomenon:

"Congestive atelectasis is the term chosen to describe a further lung change in which the microscopical picture showed maximal dilatation of the lung capillaries and complete exclusion of air from the alveolar spaces. Microscopically, the condition suggested gross hemorrhage. The areas affected were sharply limited and stood out from the surrounding tissue because of their liver-like, uniform, dark red coloration; thus they were readily distinguishable even when they coexisted with severe hyperemia in the same part of the lung. Closing the trachea before opening the chest intensified the contrast between hyperemia and congestive atelectasis. Inflation of the lung caused the congestive airless parts of the lung to disappear and a restoration of the normal pink coloration, which showed the condition to be congestive and not

hemorrhagic. The areas affected by congestive atelectasis were not confined to the particular part of the lung surface nor to any one lobe. However, they seemed to develop more frequently around the hilum or on the dorsal surfaces."

In refutation of Bert's original theory that this phenomenon was due to rapid decompression, the authors state that they have observed the phenomenon in 20 instances in the last nine years and that rapid decompression was not a factor in any of them. Eight case reports representing their experience with this phenomenon during the last three years are presented. Only one of these cases survived, that being in a robust male aged 26 years.

The authors have employed animal experimentation to support their contention that the phenomenon is the result of intravenous infusion but frankly admit their experiments have failed to clarify the etiology of the condition. However, they feel that they have demonstrated certain things: "(1) that the volume of blood in the lungs increases rapidly following hemorrhage and asphyxia; (2) that the relationship of pulmonary arterial pressure to left atrial pressure is remarkably altered immediately following the release of arterial occlusive tourniquets; (3) that the stiffening of the lung begins soon after the injection of saline solution, and occasionally becomes very pronounced in the nonshocked animal while the left atrial pressure is falling (this rules out failure of the left ventrical as the universal cause of pulmonary stiffening); (4) that stiffening of the lung appears soon after the release of arterial occlusion tourniquets and becomes pronounced by the time the shock is well established; and (5) that the rapid injection of saline solutions during tourniquet shock, when the lungs have become stiff, quickly causes changes in vascular pressures that are compatible with acute heart failure, and the severity of the shock is increased."

The authors feel that the labored breathing seen clinically is probably a manifestation of the lung stiffening. "The resistant cyanosis is manifestly caused by the continuation of a fairly rapid flow of blood through the areas rendered airless by the positive increment of blood in the pulmonary capillaries and alveoli. In this respect, congestive atelectasis differs from obstructive atelectasis."

The summary is quoted in part:

"Congestive atelectasis is a complication of the intravenous infusion of fluids. The mortality rate is high.

"The clinical picture is characterized by the rather sudden onset of dyspnea, labored expiratory breathing, tachypnea, tachycardia, fever, hypotension that is often aggravated by the transfusion of blood, restriction of thoracic motion, dullness over the involved portion of the lung, the practical absence of roentgen ray signs early, and resistant cyanosis.

"Organically, the involved parts of the lung are carnified, but when inflated with air under pressure they inflate, and appear grossly normal. Microscopically, the process is characterized by capillary congestion, intra-alveolar hemorrhage with little edema, incomplete expansion of alveoli, and compression closure of the bronchioles.

"The clinical and pathologic pictures and the clinical course of congestive atelectasis is strikingly comparable to pulmonicardiac failure. Even the ineffectiveness of digitalis as a therapeutic agent is common to both syndromes."

R. H. S.

NEWER METHODS FOR SELECTION OF PATIENTS FOR LUMBAR SYMPATHECTOMY. Travis Winsor. *California Medicine 72*:342-349 (May) 1950.

Realizing that lumbar sympathectomy for the treatment of peripheral vascular disease does not produce good results in all instances, the writer is impressed that certain diagnostic procedures employed as aids in the proper selection of patients will lead to a higher percentage of good results. The present report is based upon a study of 150 unselected cases and the conditions of the investigation were rigidly controlled.

"The degree of vasodilatation achieved by various diagnostic methods (arterial occlusion, ganglionic block established by certain agents, lumbar sympathetic block, spinal anesthesia, and indirect heating) was studied by means of the pneumoplethysmogram as well as through readings of skin temperature and skin resistance. The data obtained were interpreted as to their value in determining the type of patient with vascular disease for whom sympathectomy would be of noticeable benefit. Aterial occlusion proved itself a rapid and simple method which in most patients produced satisfactory results. As a rule, lumbar sympathectomy was effective in patients who preoperatively had shown a response upon release of arterial occlusion. A negative response, that is absence of significant increase in blood flow, does not necessarily indicate organic disease, and cannot be taken to mean that lumbar sympathectomy would always be ineffective. Ganglionic block, using 2,6 dimethyl piperidinium bromide or tetraethylammonium ion, was generally less reliable in indicating the probable result of sympathectomy than lumber sympathetic block or indirect heating. Lumbar sympathetic block with procaine was followed by a greater increase in skin temperature and blood flow than spinal anesthesia, and permitted far more accurate conclusions as to the probable outcome of sympathectomy. Subsequent to indirect heating the plethysmogram showed characteristic differences depending on the degree of vascular disease present. From the effect of this simple, safe and painless method upon the relative blood flow to the toe it becomes possible to arrive at a comparatively accurate estimate of the clinical benefit to be expected from lumbar sympathectomy."

R. H. S.

THE SELECTIVE MANAGEMENT OF MEGACOLON IN INFANTS AND CHILDREN. C. Marshall Lee, Jr., Kenneth C. Bebb, and John R. Brown. *Surgery, Gynecology and Obstetrics 91*:281-295 (Sept.) 1950.

In a discussion of the history of the development of our knowledge of megacolon and the evolution of the newer concept of Hirschprung's disease, it is pointed out that in his original description Hirschprung stated ". . . only the rectum was not enlarged, but rather seemed to be the site of some kind of slight narrowing." By 1930, it had become generally recognized that the condition was based upon an autonomic inbalance but it remained for Robertson and Kernohan to point out in 1938 the analogy to achalasia of the esophagus and thence to demonstrate the degeneration of the myenteric ganglia in the distal, undilated segment.

The authors feel that in this country too little attention has been given to the work of Bodia, Stephens, and Ward who have clarified the types of megacolon in such a way as to make intelligent selective treatment possible. The following types are recognized:

1. *Symptomatic or organic megacolon.* This term applies to cases in which the obstructing lesion is grossly demonstrable. This may occur at any age.

2. *Aganglionic or achalasic megacolon (true Hirschprung's disease).* In the light of recent contributions, this entity should no longer be grouped with "idiopathic megacolon." It is characterized by constipation from birth. The obstruction is not grossly apparent but has been shown to be due to an absence of parasympathetic ganglia in the terminal segment which remains undilated.

3. *Idiopathic Megacolon.* In this group the dilatation extends down to the anal sphincter. No definite etiological basis can be established. Two general subtypes are recognized. This first type, in which a straight dilated segment of bowel is seen, is classified as the reservoir type and usually responds to medical management. The second type exhibits long segments of coiled, dilated sigmoid, usually lying on the right side. These do not always respond to medical management and in certain instances resection of the redundant segment of sigmoid has been followed by cure.

Thus with intelligent grouping, selective treatment may be applied and good results may be expected in a greater number of instances. In the first group, relief of the obstruction is indicated. The operation recently brought forward by Swenson in which the terminal segment is resected and a pull-trough anastomosis instituted should be reserved for the aganglionic type (true Hirschprung's disease).

Several case reports illustrating the various types are included.

R. H. S.

TREATMENT OF HYPERTHYROIDSIM WITH 1-METHYL-2-MERCAPTOIMIDAZOLE. William S. Reveno and Herbert Rosenbaum. *Journal of the American Medical Association 143:*1407-1408 (Aug. 19) 1950.

The powerful antithyroid activity of 1-methyl-2-mercaptoimidazole (tapazol) was first noted by Stanley and Astwood and was reported last year. Raveno and Rosenbaum have used this new drug in the treatment of 18 patients with hyperthyroidism during a six month period and have found it fully as efficient as thiouracil and prophlthouracil in this condition. In clinical trial the drug appears to be 20 to 50 times as powerful as thiouracil and acts best when administered in doses of 2 to 5 mg. every eight hours. All cases responded in a manner closely resembling that observed when thiouracil is given. No toxic reactions were noted but the authors feel that its use in a larger number of patients is needed to establish its lack of toxicity.

R. H. S.

CANCER OF THE RECTUM. FIVE AND TEN YEAR FOLLOW-UP STUDY OF CASES OF CANCER BELOW THE PERITONEAL REFLECTION. Damon B. Pfeiffer and David B. Miller. *Surgery, Gynecology and Obstetrics 91:*319-322 (Sept.) 1950.

Using the anterior reflection of the peritoneum as a guide a demarcation point between the rectum and the sigmoid as advocated by Gilchrist and David, the authors have reviewed their cases of carcinoma lying below this point treated by the Miles procedure or one of its modifications. Of 180 cases, 153 were operated upon with an operative mortality rate of 20.1 per cent, a five year survival rate of 37.2 per cent and a ten year survival rate of 21.5 per cent. The five year mortality rate is somewhat higher than that reported by Gilchrist but inclusion of palliative operations may account for some of the discrepancy. At any rate, the authors feel that this serves to substantiate the

growing conviction that the "extraperitoneal," that is those below the peritoneal reflection, carry a distinctly higher mortality rate than the "intraperitoneal." For this reason, they feel that anterior resection or anything less than a Miles operation is insufficient and perhaps even a more radical procedure is indicated.

They urge that the peritoneal reflection be considered as a guide to differentiate between cancer of the rectum and cancer of the sigmoid, thus eliminating the use of the vague term "rectosigmoid."

R. H. S.

EFFECT OF ANALGESICS AND ANTISPASMODICS ON COMMON DUCT PRESSURES. A. R. Curreri and J. W. Gale. *Annals of Surgery 132*:348-361 (Sept.) 1950.

Using a manometer connected to the patient's cholecystostomy tube and a special recording device, the authors have been able to study and record the effect of certain drugs on the resistance to fluid pressure offered by the common duct. Twenty-eight patients were studied on 81 occasions and each time two to four drugs were investigated. Their conclusions are quoted:

"1. Physiologic activities such as talking, walking, coughing, and straining increased the common duct pressure.

"2. The pressure ordinarily required to overcome the sphincter of Oddi tone causes neither pain nor discomfort.

"3. However, analgesics, parasympathetic stimulators as urecholine, and other agents may increase the sphincter tone to a point where ductal pressures will rise to a pain producing level (biliary dyskinesia). This level is twenty or more centimeters of water pressure.

"4. Analgesics as a group are powerful stimulators of the sphincter of Oddi when given in the usually prescribed doses. The resulting rise in ductal pressures may accentuate, rather than lessen, biliary colic. Therefore, the effective pain relieving dose for biliary colic must be sufficient to produce marked central nervous system depression.

"5. Except for amyl nitrite and possibly aminophylin, antispasmodics given in clinical doses were extremely disappointing and failed to overcome the analgesic produced spasm.

"6. Amyl nitrite definitely and consistently responded by lowering ductal pressures for short periods.

"7. When nitroglycerine and papaverine were given in large doses of 1/50 gr. and 2 gr. respectively, an effective lowering of ductal pressure was noted.

"8. Atropine in doses up to 1/33 of a grain failed appreciably to alter ductal pressures.

"9. The synthetic antispasmodics Syntropan, Pavatrine, Amethone, Nu-2172 and Octin apparently have no effect on the sphincter of Oddi.

"10. Fatty meals, Nitranitol, and Etamon also failed to lower ductal pressure.

"11. DHO 180 and splanchnic block warrant further study.

"12. Apparently splanchnic block does control pain due to overdistension and increase in common duct pressure."

R. H. S.

RESULTS AFTER REMOVAL OF INTERVERTEBRAL DISCS. Richard T. Odell, Robert H. Ramsey and J. Albert Key. *Southern Medical Journal 43:*759-765 (Sept.) 1950.

The authors herewith present the results of their observations on 455 patients operated on with removal of one or more intervertebral discs in an attempt to relieve low back pain or sciatica. In this series there was one death (wound infection and septicemia in the period before penicillin was generally available). The remaining 454 patients were sent questionnaires. Of these, 310 (68.3 per cent) were answered and returned. These were unselected and, the authors feel, represent a fair cross section. The questionnaire asked that the patient indicate whether they were well, better, unimproved, or worse since the operation; how long they were disabled after leaving the hospital; when they were able to return to work; if they were glad or sorry that they had the operation, etc. The statistical results of the analysis of these replies are presented in various tabulations. The summary is quoted:

"The operative results of lumbar intervertebral discs in 310 cases followed by questionnaire are reported. Satisfactory results were obtained in 89.4 per cent and poor results in 10.6 per cent. Forty-two per cent were completely relieved of pain. Forty-five and a half per cent had slight intermittent pain which did not prevent their return to work. Spinal fusion was seldom done in this series and is seldom necessary. The use of myelography as a routine diagnostic procedure was not employed in this series. The operative treatment of ruptured intervertebral discs is a satisfactory procedure when the patient is properly selected and the operation is performed by a surgeon who has learned to do it properly. The results in compensation cases are sufficiently good to warrant the operative treatment of patients with intractable low back and sciatic pain. Operation should not be advised for any of these patients until conservative treatment has been given a reasonable trial and has failed."

R. H. S.

THE PROPHYLAXIS OF INTRAVASCHLAR CLOTTING BY THE USE OF ALPHA TOCOPHEROL AND CALCIUM. John H. Kay, George Balla, Samerill B. Hutton and Alton Ochsner. *New Orleans Medical and Surgical Journal 103:*116-120 (Sept.) 1950.

Prompted by the discovery that water soluble salts of alpha tocopherol actively inhibit thrombin and that though this property is lost in the presence of fibrinogen but could be retained by the use of the calcium salt, the authors through further investigation found that a globulin fraction of protein which functioned as an antithrombin in virto actually contained tocopheral as a portion of its molecule. They have developed a simple plasma antithrombin test based on these observations.

In a group of 238 cases involving large major surgical procedures, 145 maintained an antithrombin level of 1:16 or greater. In this group, there were no instances of clinical phlebothrombosis and only one nonfatal embolus. In the remaining 93 patients whose levels fell to 1:8 or lower, 19 developed signs of intravascular clotting and five patients died, four from pulmonary embolism and one from cerebral thrombosis.

In a clinical application of the principles, 175 patients had been treated with alpha tocopheral and calcium gluconate. In this group there had been

no evidence of phlebothrombosis and only one patient exhibited a prothrombin level below 1:16.

The authors emphasize that tocopherol does not function as an antithrombin unless calcium is administered concomitantly. The use of alpha tocopherol in oil intramuscularly consistently caused a fall in the antithrombin level and is therefore contraindicated in the prophylactic treatment of phlebothrombosis.

R. H. S.

SOLITARY CECAL DIVERTICULA. A Case of Solitary, Secondary, Acquired Diverticulum, Associated with Ileocecal Tuberculosis. Henrik V. A. Heikel. *Annales Chirurgiae et Gynaecolociae Fenniae 39*:134-151 (Fasc. 2) 1950.

Following a brief discussion of the classification and etiology of intestinal diverticula, the author presents his case which in brief is that of a woman with hereditary tuberculosis, aged 62, who had no subjective troubles in the digestive tract, but had lost in weight. A resistance in the iliac fossa was accidentally discovered. As carcinoma of the cecum was suspected, half of the ascending colon was resected and an ileotransversecolostomy was performed. The patient recovered. Upon x-ray examination fourteen months later there was no sign of diverticula in the large intestine. In the specimen, a diverticulum as large as the end of the thumb was found. It contained all layers of the intestinal will, was not ulcerated and contained a fecalith. The diverticulum was situated close to a stenosal process of tuberculous nature which was present at the ileocecal valve.

In search of the world literature, the author was able to find reports of 71 cases of solitary diverticulum of the cecum or lower half of the ascending colon. His conclusions based on the collocation of the cases found in the literature as well as his own case are quoted in part:

"1. The condition is very uncommon and rarely occurs before the age of 20, but may appear in all other age groups.

"2. No reply was found to the question regarding the etiology of solitary diverticulum—except in the cases in which a manifest local cause was found.

"3. If no complications arise the solitary diverticulum of the cecum is asymptomatic. The commonest complication is nonspecific inflammation. Specific inflammation (tuberculous) was observed in three instances besides the reported case.

"4. The debut of the diverticulitis is acute as a rule—often preceded by one or more attacks of similar type.

"5. The symptoms are not characteristic; hence the diagnosis in acute cases is generally appendicitis, in chronic cases tumor or tuberculosis.

"6. X-ray examination is a valuable adjuvant to diagnosis in exceptional cases only. In an acute stage x-ray examination is contraindicated.

"7. Surgical therapy is employed almost without exception.

"8. The prognosis quoad vitam is good provided the necessary surgical interference is done at the right moment."

Death occurred in only three instances in the entire group of 72 cases.

R. H. S.

## ANNOUNCEMENT

The Fifth Congress of the Pan-Pacific Surgical Association will be held in Honolulu November 10-21, 1951.

The object of the Pan-Pacific Surgical Association is to bring together surgeons from countries bordering on the Pacific Ocean so as to permit the exchange of surgical ideas and methods and to develop a spirit of good fellowship among the various races represented. Although it was planned that meetings would be held every three years, world events have permitted but four conferences since the organization was conceived—the first in 1929 and the last in 1948.

The Fifth Congress provides an opportunity for doctors to combine a delightful vacation in Hawaii with attendance at a scientific meeting, the program of which will be presented by topflight surgeons from the Pacific area countries, as planned by the program committee. Doctors are urged to bring their families with them and are promised luxurious accommodations.

Dr. F. J. Pinkerton, President of the association, has been officially appointed as travel agent for those coming to the meeting. To be assured of preferred accommodations, travel and hotel reservations should be made through Dr. Pinkerton.

Further information may be obtained by writing the Pan-Pacific Surgical Association office, Suite 7, Young Building, Honolulu, T. H.

## ANNOUNCEMENT

The annual assembly of The Southeastern Surgical Congress will be held at the Hollywood Beach Hotel, Hollywood, Florida, April 11-14, 1951. For hotel reservations, write to the manager of the hotel.

For other information, write to the secretary, Dr. B. T. Beasley, 701 Hurt Bldg., Atlanta, Georgia.